

SEQUENCE LISTING

<110> Microbial Technics Limited

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<120> Proteins

<130> PWC/P21122WO

<140> PCT/GB99/02452

<141> 1999-07-27

<150> GB 9816336.3

<151> 1998-07-27

<150> US 60/125329

<151> 1999-03-19

<160> 196

<170> PatentIn Ver. 2.1

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<211> 1200

<212> DNA

<213> Streptococcus pneumoniae

<400> 1

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<212> PRT

<213> Streptococcus pneumoniae

<400> 2

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Gly Ile Ser Val Gly Ile Gly His Leu Gln Gly Ser Ser Met Ala Lys
 35 40 45

Asn Asn Lys Val Ala Val Val Thr Thr Val Pro Ser Val Ala Glu Gly
 50 55 60

Leu Lys Asn Val Asn Gly Val Asn Phe Asp Tyr Lys Asp Glu Ala Ser
 65 70 75 80

103600-962960

Leu Ile Ser Leu Phe Met Tyr Val Val Leu Ala Ala Phe Leu Gly Ser
275 280 285

Met Val Ser Arg Pro Glu Asp Ser Gly Lys Ala Leu Ser Pro Leu Met
 290 295 300

Ile Leu Ile Met Gly Gly Phe Phe Gly Val Thr Ala Leu Gly Ala Ala
 305 310 315 320

Gly Asp Asn Leu Leu Leu Lys Ile Gly Ser Tyr Ile Pro Phe Ile Ser
 325 330 335

Thr Phe Phe Met Pro Phe Arg Thr Ile Asn Asp Tyr Ala Gly Gly Ala
 340 345 350

Glu Ala Trp Ile Ser Leu Ala Ile Thr Val Ile Phe Ala Val Val Ala
 355 360 365

Thr Gly Phe Ile Gly Arg Met Tyr Ala Ser Leu Val Leu Gln Thr Asp
 370 375 380

Asp Leu Gly Ile Trp Lys Thr Phe Lys Arg Ala Leu Ser Tyr Lys
 385 390 395

<210> 3

<211> 1125

<212> DNA

<213> Streptococcus pneumoniae

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<213> Streptococcus pneumoniae
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Val Ile Ser Ala Tyr Asn Glu Glu Lys Tyr Leu Pro Gly Leu Ile Glu
35 40 45

Ile Asn Ala Met Ser Thr Asp Gly Thr Thr Ala Ile Ile Gln Gln Phe
65 70 75 80

Lys Lys Asn Gln Ala Ser Gly Phe Asn Leu Gly Val Lys His Ser Val
100 105 110

Phe Leu Leu Leu Ser Leu Leu Thr Leu Leu Thr Leu Leu Lys His Lys
305 310 315 320

Asn Gly Phe Leu Ile Val Met Pro Phe Ile Leu Phe Ser Ile His Phe
 325 330 335

Ala Tyr Gly Leu Gly Thr Ile Val Gly Leu Ile Arg Gly Phe Lys Trp
 340 345 350

Lys Lys Glu Tyr Lys Arg Thr Ile Ile Tyr Leu Asp Lys Ile Ser Gln
 355 360 365

Ile Asn Gln Asn Met Leu
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<212> DNA

<213> Streptococcus pneumoniae

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 acactaattg gttttttggc aggggtgatt ggaactagtg ttatagttct tcatcttgaa 600
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<210> 6

<211> 231

<212> PRT

<213> Streptococcus pneumoniae

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1 5 10 15

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35 40 45

Lys Pro Gly Leu Thr Asn Gln Asp Leu Gln Ala Gly Thr Tyr Leu Val
65 70 75 80

Val Ser Asp Leu Lys Leu Asp Leu Thr Pro Lys Gly Leu Ala Asn Lys
100 105 110

Asn Asp Arg Val Pro Glu Glu Ala Ser Arg Ile Ala Asn Ser Leu Arg
130 135 140

Thr Thr Leu Glu Glu Ala Arg Pro Ala Ile Ser Pro Ser Ser Pro Asn
165 170 175

Ile Lys Arg Asn Thr Leu Ile Gly Phe Leu Ala Gly Val Ile Gly Thr
180 185 190

Ser Val Ile Val Leu His Leu Glu Leu Leu Asp Thr Arg Val Lys Arg
 195 200 205

Pro Glu Asp Ile Glu Asn Thr Leu Gln Met Thr Leu Leu Gly Val Val
 210 215 220

Pro Asn Leu Gly Lys Leu Lys
 225 230

<210> 7

<211> 555

<212> DNA

<213> Streptococcus pneumoniae

<400> 7

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<210> 8

<211> 184

<212> PRT

<213> Streptococcus pneumoniae

<400> 8

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Arg Asp Val Phe Gly Lys Asn Gln
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<210> 9

<211> 306

<212> DNA

<213> Streptococcus pneumoniae

<400> 9

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<210> 10

<211> 101

<212> PRT

<213> Streptococcus pneumoniae

<400> 10

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Tyr Asn His Ala Arg His Asp Leu Ser Glu Asp Leu Val Ala Ala Leu
      20              25             30

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Leu Glu Thr Thr Lys Lys Leu Pro Thr Thr Asn Glu Gln Leu Gln Ala
      35              40             45

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Val Arg Leu Ser Gly Leu Val Asn Arg Glu Leu Leu Leu Asn Pro Lys
      50              55             60

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His Pro Ala Pro Glu Leu Leu Asn Leu Ala Arg Phe Val Lys Arg Glu
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Glu Ala Lys Tyr Arg Gly Thr Ala Thr Ser Ala Leu Met Tyr Glu Glu
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Leu Phe Lys Met Leu

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<210> 11

<211> 945

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 11

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<210> 12

<211> 314

<212> PRT

<213> *Streptococcus pneumoniae*

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 20 25 30

Leu Leu Phe Val Gly Ile Gln Ser Asp Gly Ile Lys Ser Leu Leu Ser
 35 40 45

Met Ser Lys Glu Pro Val Tyr Asp Ser Arg Thr Glu Lys Leu Thr Phe
 50 55 60

Gly Lys Glu Val Glu Asn Leu Glu Ile Thr Leu His Gln His Thr Leu
 65 70 75 80

Thr Ile Thr Asp Ser Phe Asp Asp Gln Ile His Ile Ser Tyr His Pro
 85 90 95

Ser Leu Ser Ala His His Asp Leu Ile Thr Asn Gln Asn Asp Arg Thr
 100 105 110

Leu Ser Leu Thr Asp Lys Lys Leu Ser Glu Thr Pro Phe Leu Ser Ser
 115 120 125

Gly Ile Gly Gly Ile Leu His Ile Ala Ser Ser Tyr Ser Ser Arg Phe
 130 135 140

Glu Glu Val Ile Leu Arg Leu Pro Lys Gly Arg Thr Leu Lys Gly Ile
 145 150 155 160

Asn Ile Ser Ala Asn Arg Gly Gln Thr Thr Ile Ile Asn Ala Ser Leu
 165 170 175

Glu Asn Ala Thr Leu Asn Thr Asn Ser Tyr Ile Leu Arg Ile Glu Gly
 180 185 190

Ser Arg Ile Lys Asn Ser Lys Leu Thr Thr Pro Asn Ile Val Asn Ile
 195 200 205

Phe Asp Thr Val Leu Thr Asp Ser Gln Leu Glu Ser Thr Glu Asn His
 210 215 220

Phe His Ala Glu Asn Ile Gln Val His Gly Lys Val Glu Leu Thr Ala
225 230 235 240

Lys Asp Tyr Leu Arg Ile Ile Leu Asp Gln Lys Glu Ser Gln Arg Ile
245 250 255

Asn Trp Asp Ile Ser Ser Asn Tyr Gly Ser Ile Phe Gln Phe Thr Arg
260 265 270

Glu Lys Pro Glu Ser Arg Gly Thr Glu Leu Ser Asn Pro Tyr Lys Thr
275 280 285

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290 295 300

Ile Asp Leu Ile Ser Thr Pro Ser Arg Arg
305 310

<210> 13

<211> 879

<212> DNA

<213> Streptococcus pneumoniae

<400> 13

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<211> 292

<212> PRT

<213> Streptococcus pneumoniae

<400> 14

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 20 25 30

Glu Thr Ile Ala Asp Leu Asp Thr Pro Ile Glu Lys Asn Thr Gln Leu
 35 40 45

Glu Glu Glu Val Pro Gln Ala Glu Val Glu Leu Glu Ser Gln Gln Glu
 50 55 60

Glu Lys Ile Glu Ala Pro Glu Asp Ser Glu Ala Arg Thr Glu Ile Glu
 65 70 75 80

Glu Lys Lys Ala Ser Asn Ser Thr Glu Glu Glu Pro Asp Leu Ser Lys
 85 90 95

Glu Thr Glu Lys Val Thr Ile Ala Glu Glu Ser Gln Glu Ala Leu Pro
 100 105 110

Gln Gln Lys Ala Thr Thr Lys Glu Pro Leu Leu Ile Ser Lys Ser Leu
 115 120 125

Glu Ser Pro Tyr Ile Pro Asp Gln Ala Pro Lys Ser Arg Asp Lys Trp
 130 135 140

Lys Glu Gln Val Leu Asp Phe Trp Ser Trp Leu Val Glu Ala Ile Lys
 145 150 155 160

Ser Pro Thr Ser Lys Leu Glu Thr Ser Ile Thr His Ser Tyr Thr Ala
 165 170 175

Phe Leu Leu Leu Ile Leu Phe Ser Ala Ser Ser Phe Phe Phe Ser Ile
 180 185 190

Tyr His Ile Lys His Ala Tyr Tyr Gly His Ile Ala Ser Ile Asn Ser
 195 200 205

Arg Phe Pro Glu Gln Leu Ala Pro Leu Thr Leu Phe Ser Ile Ile Ser
 210 215 220

Ile Leu Val Ala Thr Thr Leu Phe Phe Phe Ser Phe Leu Leu Gly Ser
 225 230 235 240

Phe Val Val Arg Arg Phe Ile His Gln Glu Lys Asp Trp Thr Leu Asp
 245 250 255

Lys Val Leu Gln Gln Tyr Ser Gln Leu Leu Ala Ile Pro Ile Ser Ser
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 275 280 285

Pro Ser Cys Val
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<211> 990

<212> DNA

<213> Streptococcus pneumoniae

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<210> 16

<211> 329

<212> PRT

<213> Streptococcus pneumoniae

<400> 16

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1

5

10

15

Phe Leu Lys Lys Glu Arg Glu Val Ile Ser Met Arg Lys Trp Thr Lys

20

25

30

Gly Phe Leu Ile Phe Gly Val Val Thr Thr Val Ile Gly Phe Ile Leu

35

40

45

Leu Phe Val Gly Ile Gln Ser Asp Gly Ile Lys Ser Leu Leu Ser Met

50

55

60

Ser Lys Glu Pro Val Tyr Asp Ser Arg Thr Glu Lys Leu Thr Phe Gly
65 70 75 80

Lys Glu Val Glu Asn Leu Glu Ile Thr Leu His Gln His Thr Leu Thr
85 90 95

Ile Thr Asp Ser Phe Asp Asp Gln Ile His Ile Ser Tyr His Pro Ser
100 105 110

Leu Ser Ala His His Asp Leu Ile Thr Asn Gln Asn Asp Arg Thr Leu
115 120 125

Ser Leu Thr Asp Lys Lys Leu Ser Glu Thr Pro Phe Leu Ser Ser Gly
130 135 140

Ile Gly Gly Ile Leu His Ile Ala Ser Ser Tyr Ser Ser Arg Phe Glu
145 150 155 160

Glu Val Ile Leu Arg Leu Pro Lys Gly Arg Thr Leu Lys Gly Ile Asn
165 170 175

Ile Ser Ala Asn Arg Gly Gln Thr Thr Ile Ile Asn Ala Ser Leu Glu
180 185 190

Asn Ala Thr Leu Asn Thr Asn Ser Tyr Ile Leu Arg Ile Glu Gly Ser
195 200 205

Arg Ile Lys Asn Ser Lys Leu Thr Thr Pro Asn Ile Val Asn Ile Phe
210 215 220

Asp Thr Val Leu Thr Asp Ser Gln Leu Glu Ser Thr Glu Asn His Phe
225 230 235 240

His Ala Glu Asn Ile Gln Val His Gly Lys Val Glu Leu Thr Ala Lys
245 250 255

Asp Tyr Leu Arg Ile Ile Leu Asp Gln Lys Glu Ser Gln Arg Ile Asn
260 265 270

FOUO 92200

Trp Asp Ile Ser Ser Asn Tyr Gly Ser Ile Phe Gln Phe Thr Arg Glu
 275 280 285

Lys Pro Glu Ser Arg Gly Thr Glu Leu Ser Asn Pro Tyr Lys Thr Glu
 290 295 300

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 305 310 315 320

Asp Leu Ile Ser Thr Pro Ser Arg Arg
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<210> 17

<211> 79

<212> DNA

<213> Streptococcus pneumoniae

<400> 17

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 ggacgctgct attttaatc 79

<210> 18

<211> 26

<212> PRT

<213> Streptococcus pneumoniae

<400> 18

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Arg Val Gly Glu Gly Arg Cys Tyr Phe Asn
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<210> 19

<211> 715

<212> DNA

<213> Streptococcus pneumoniae

<400> 19

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<212> PRT

<213> Streptococcus pneumoniae

<400> 20

Asp Lys Glu Ala Leu Ser Asn Leu Asn Leu Gln Ile Glu Asn Gly Glu

1

5

10

15

Ile Met Gly Leu Ile Gly His Asn Gly Ala Gly Lys Ser Thr Thr Ile

20

25

30

Lys Ser Leu Val Ser Ile Ile Ser Pro Ser Ser Gly Arg Ile Leu Val

35

40

45

Asp Gly Gln Glu Leu Ser Glu Asn Arg Leu Ala Ile Lys Arg Lys Ile

50

55

60

Gly Arg Lys Glu Glu Val Ala Asp Ala Ser Gln Gly His
225 230 235

<210> 21

<211> 360

<212> DNA

<213> Streptococcus pneumoniae

<400> 21

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<212> PRT

<213> Streptococcus pneumoniae

<400> 22

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 35 40 45

Leu Ala Thr Trp Leu Lys Lys Leu Leu Leu Val Ser Ser Val Val Val
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Ala Ser Ala Gly Cys Ser Leu Ile Ile Arg Ser Ile Lys Ala Thr Trp
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Ser Ser Phe Glu Met Val Ser Met Leu Ala Leu Ile Trp Leu Ile Arg
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Val Leu Lys Pro Gly Ser Thr
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<212> DNA

<213> *Streptococcus pneumoniae*

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1455

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<211> 484

<212> PRT

<213> Streptococcus pneumoniae

<400> 24

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10

15

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20

25

30

Asn Lys Asp Asn Asn Arg Val Ser Tyr Val Asp Gly Ser Gln Ser Ser

35

40

45

Gln Lys Ser Glu Asn Leu Thr Pro Asp Gln Val Ser Gln Lys Glu Gly

50

55

60

Ile Gln Ala Glu Gln Ile Val Ile Lys Ile Thr Asp Gln Gly Tyr Val

65

70

75

80

Thr Ser His Gly Asp His Tyr His Tyr Tyr Asn Gly Lys Val Pro Tyr

85

90

95

Asp Ala Leu Phe Ser Glu Glu Leu Leu Met Lys Asp Pro Asn Tyr Gln

100

105

110

Leu Lys Asp Ala Asp Ile Val Asn Glu Val Lys Gly Gly Tyr Ile Ile

115

120

125

Lys Val Asp Gly Lys Tyr Tyr Val Tyr Leu Lys Asp Ala Ala His Ala

130

135

140

Asp Asn Val Arg Thr Lys Asp Glu Ile Asn Arg Gln Lys Gln Glu His

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Glu Leu Ser Ser Ala Ser Asp Gly Tyr Ile Phe Asn Pro Lys Asp Ile
 370 375 380

Val Glu Glu Thr Ala Thr Ala Tyr Ile Val Arg His Gly Asp His Phe
 385 390 395 400

His Tyr Ile Pro Lys Ser Asn Gln Ile Gly Gln Pro Thr Leu Pro Asn
 405 410 415

Asn Ser Leu Ala Thr Pro Ser Pro Ser Leu Pro Ile Asn Pro Gly Thr
 420 425 430

Ser His Glu Lys His Glu Glu Asp Gly Tyr Gly Phe Asp Ala Asn Arg
 435 440 445

Ile Ile Ala Glu Asp Glu Ser Gly Phe Val Met Ser His Gly Asp His
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Asn His Tyr Phe Phe Lys Lys Asp Leu Thr Glu Glu Gln Ile Lys Val
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Arg Lys Asn Ile

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<211> 840

<212> DNA

<213> Streptococcus pneumoniae

<400> 25

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<210> 26

<211> 279

<212> PRT

<213> Streptococcus pneumoniae

<400> 26

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35 40 45

Ile Leu Gln Leu Leu Asn Gly Leu Leu Val Pro Ser Gln Gly Ser Val

50 55 60

Arg Val Phe Asp Thr Leu Ile Thr Ser Thr Ser Lys Asn Lys Asp Ile

65 70 75 80

Arg Gln Ile Arg Lys Gln Val Gly Leu Val Phe Gln Phe Ala Glu Asn

85 90 95

Gln Ile Phe Glu Glu Thr Val Leu Lys Asp Val Ala Phe Gly Pro Gln

100 105 110

Asn Phe Gly Val Ser Glu Glu Asp Ala Val Lys Thr Ala Arg Glu Lys
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Leu Ala Leu Val Gly Ile Asp Glu Ser Leu Phe Asp Arg Ser Pro Phe
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Glu Leu Ser Gly Gly Gln Met Arg Arg Val Ala Ile Ala Gly Ile Leu
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Ala Met Glu Pro Ala Ile Leu Val Leu Asp Glu Pro Thr Ala Gly Leu
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Asp Pro Leu Gly Arg Lys Glu Leu Met Thr Leu Phe Lys Lys Leu His
 180 185 190

Gln Ser Gly Met Thr Ile Val Leu Val Thr His Leu Met Asp Asp Val
 195 200 205

Ala Glu Tyr Ala Asn Gln Val Tyr Val Met Glu Lys Gly Arg Leu Val
 210 215 220

Lys Gly Gly Lys Pro Ser Asp Val Phe Gln Asp Val Val Phe Met Glu
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Glu Val Gln Leu Gly Val Pro Lys Ile Thr Ala Phe Cys Lys Arg Leu
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<210> 27

<211> 6360

<212> DNA

<213> Streptococcus pneumoniae

<400> 27

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<212> PRT

<213> Streptococcus pneumoniae

<400> 28

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Asn Pro Lys Lys Glu Asp Lys Val Val Tyr Ile Ala Glu Phe Lys Asp
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Ser Ser Val Glu Arg Ala Gln Lys Val Gln Pro Met Met Asn His Ala
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Asp Asp Ala Lys Ala Ser Met Arg Phe Lys Lys Glu Asp Leu Lys Gly
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Thr Asp Lys Asn Tyr Trp Leu Ser Asp Lys Ile Pro His Ala Phe Asn
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Tyr Tyr Asn Gly Gly Lys Ile Thr Val Glu Lys Tyr Asp Asp Gly Arg
 260 265 270

Asp Tyr Phe Asp Pro His Gly Met His Ile Ala Gly Ile Leu Ala Gly
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Ser Gly Phe Ala Gly Asp Glu Thr Met Phe His Ala Ile Glu Asp Ser
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485 490 495

Asp Leu Lys Asn Ala Phe Lys Lys Ala Met Asp Lys Gly Ala Arg Ala
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Ile Met Val Val Asn Thr Val Asn Tyr Tyr Asn Arg Asp Asn Trp Thr
515 520 525

Glu Leu Pro Ala Met Gly Tyr Glu Ala Asp Glu Gly Thr Lys Ser Gln
530 535 540

Val Phe Ser Ile Ser Gly Asp Asp Gly Val Lys Leu Trp Asn Met Ile
545 550 555 560

Asn Pro Asp Lys Lys Thr Glu Val Lys Arg Asn Asn Lys Glu Asp Phe
565 570 575

Lys Asp Lys Leu Glu Gln Tyr Tyr Pro Ile Asp Met Glu Ser Phe Asn
580 585 590

Ser Asn Lys Pro Asn Val Gly Asp Glu Lys Glu Ile Asp Phe Lys Phe
595 600 605

Ala Pro Asp Thr Asp Lys Glu Leu Tyr Lys Glu Asp Ile Ile Val Pro
610 615 620

Ala Gly Ser Thr Ser Trp Gly Pro Arg Ile Asp Leu Leu Leu Lys Pro
625 630 635 640

Asp Val Ser Ala Pro Gly Lys Asn Ile Lys Ser Thr Leu Asn Val Ile
645 650 655

Asn Gly Lys Ser Thr Tyr Gly Tyr Met Ser Gly Thr Ser Met Ala Thr
660 665 670

Pro Ile Val Ala Ala Ser Thr Val Leu Ile Arg Pro Lys Leu Lys Glu
675 680 685

Met Leu Glu Arg Pro Val Leu Lys Asn Leu Lys Gly Asp Asp Lys Ile
690 695 700

Asp Leu Thr Ser Leu Thr Lys Ile Ala Leu Gln Asn Thr Ala Arg Pro
705 710 715 720

Met Met Asp Ala Thr Ser Trp Lys Glu Lys Ser Gln Tyr Phe Ala Ser
725 730 735

Pro Arg Gln Gln Gly Ala Gly Leu Ile Asn Val Ala Asn Ala Leu Arg
740 745 750

Asn Glu Val Val Ala Thr Phe Lys Asn Thr Asp Ser Lys Gly Leu Val
755 760 765

Asn Ser Tyr Gly Ser Ile Ser Leu Lys Glu Ile Lys Gly Asp Lys Lys
770 775 780

Tyr Phe Thr Ile Lys Leu His Asn Thr Ser Asn Arg Pro Leu Thr Phe
785 790 795 800

Phe Asn Asn Glu Gly Ile Asn Ala Pro Ser Ser Ser Gly Ser Lys Ile
995 1000 1005

Ala Asn Ile Tyr Pro Leu Asp Ser Asn Gly Asn Pro Gln Asp Ala Gln
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Leu Glu Arg Gly Leu Thr Pro Ser Pro Leu Val Leu Arg Ser Ala Glu
 1025 1030 1035 1040

Glu Gly Leu Ile Ser Ile Val Asn Thr Asn Lys Glu Gly Glu Asn Gln
 1045 1050 1055

Arg Asp Leu Lys Val Ile Ser Arg Glu His Phe Ile Arg Gly Ile Leu
 1060 1065 1070

Asn Ser Lys Ser Asn Asp Ala Lys Gly Ile Lys Ser Ser Lys Leu Lys
 1075 1080 1085

Val Trp Gly Asp Leu Lys Trp Asp Gly Leu Ile Tyr Asn Pro Arg Gly
 1090 1095 1100

Arg Glu Glu Asn Ala Pro Glu Ser Lys Asp Asn Gln Asp Pro Ala Thr
 1105 1110 1115 1120

Lys Ile Arg Gly Gln Phe Glu Pro Ile Ala Glu Gly Gln Tyr Phe Tyr
 1125 1130 1135

Lys Phe Lys Tyr Arg Leu Thr Lys Asp Tyr Pro Trp Gln Val Ser Tyr
 1140 1145 1150

Ile Pro Val Lys Ile Asp Asn Thr Ala Pro Lys Ile Val Ser Val Asp
 1155 1160 1165

Phe Ser Asn Pro Glu Lys Ile Lys Leu Ile Thr Lys Asp Thr Tyr His
 1170 1175 1180

Lys Val Lys Asp Gln Tyr Lys Asn Glu Thr Leu Phe Ala Arg Asp Gln
 1185 1190 1195 1200

Lys Glu His Pro Glu Lys Phe Asp Glu Ile Ala Asn Glu Val Trp Tyr
 1205 1210 1215

Ile Ile Ala Tyr Asp Asp Gly Thr Asp Leu Glu Tyr Glu Thr Glu Lys
1410 1415 1420

Leu Asp Glu Ile Lys Ser Lys Ile Tyr Gly Val Leu Ser Pro Ser Lys
 1425 1430 1435 1440

Asp Gly His Phe Glu Ile Leu Gly Lys Ile Ser Asn Val Ser Lys Asn
 1445 1450 1455

Ala Lys Val Tyr Tyr Gly Asn Asn Tyr Lys Ser Ile Glu Ile Lys Ala
 1460 1465 1470

Thr Lys Tyr Asp Phe His Ser Lys Thr Met Thr Phe Asp Leu Tyr Ala
 1475 1480 1485

Asn Ile Asn Asp Ile Val Asp Gly Leu Ala Phe Ala Gly Asp Met Arg
 1490 1495 1500

Leu Phe Val Lys Asp Asn Asp Gln Lys Lys Ala Glu Ile Lys Ile Arg
 1505 1510 1515 1520

Met Pro Glu Lys Ile Lys Glu Thr Lys Ser Glu Tyr Pro Tyr Val Ser
 1525 1530 1535

Ser Tyr Gly Asn Val Ile Glu Leu Gly Glu Gly Asp Leu Ser Lys Asn
 1540 1545 1550

Lys Pro Asp Asn Leu Thr Lys Met Glu Ser Gly Lys Ile Tyr Ser Asp
 1555 1560 1565

Ser Glu Lys Gln Gln Tyr Leu Leu Lys Asp Asn Ile Ile Leu Arg Lys
 1570 1575 1580

Gly Tyr Ala Leu Lys Val Thr Thr Tyr Asn Pro Gly Lys Thr Asp Met
 1585 1590 1595 1600

Leu Glu Gly Asn Gly Val Tyr Ser Lys Glu Asp Ile Ala Lys Ile Gln
 1605 1610 1615

Lys Ala Asn Pro Asn Leu Arg Ala Leu Ser Glu Thr Thr Ile Tyr Ala
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Asp Ser Arg Asn Val Glu Asp Gly Arg Ser Thr Gln Ser Val Leu Met
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Ser Ala Leu Asp Gly Phe Asn Ile Ile Arg Tyr Gln Val Phe Thr Phe
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Lys Met Asn Asp Lys Gly Glu Ala Ile Asp Lys Asp Gly Asn Leu Val
 1665 1670 1675 1680

Thr Asp Ser Ser Lys Leu Val Leu Phe Gly Lys Asp Asp Lys Glu Tyr
 1685 1690 1695

Thr Gly Glu Asp Lys Phe Asn Val Glu Ala Ile Lys Glu Asp Gly Ser
 1700 1705 1710

Met Leu Phe Ile Asp Thr Lys Pro Val Asn Leu Ser Met Asp Lys Asn
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Tyr Phe Asn Pro Ser Lys Ser Asn Lys Ile Tyr Val Arg Asn Pro Glu
 1730 1735 1740

Phe Tyr Leu Arg Gly Lys Ile Ser Asp Lys Gly Gly Phe Asn Trp Glu
 1745 1750 1755 1760

Leu Arg Val Asn Glu Ser Val Val Asp Asn Tyr Leu Ile Tyr Gly Asp
 1765 1770 1775

Leu His Ile Asp Asn Thr Arg Asp Phe Asn Ile Lys Leu Asn Val Lys
 1780 1785 1790

Asp Gly Asp Ile Met Asp Trp Gly Met Lys Asp Tyr Lys Ala Asn Gly
 1795 1800 1805

Phe Pro Asp Lys Val Thr Asp Met Asp Gly Asn Val Tyr Leu Gln Thr
 1810 1815 1820

Gly Tyr Ser Asp Leu Asn Ala Lys Ala Val Gly Val His Tyr Gln Phe
 1825 1830 1835 1840

0076073404

Leu Tyr Asp Asn Val Lys Pro Glu Val Asn Ile Asp Pro Lys Gly Asn
 1845 1850 1855

Thr Ser Ile Glu Tyr Ala Asp Gly Lys Ser Val Val Phe Asn Ile Asn
 1860 1865 1870

Asp Lys Arg Asn Asn Gly Phe Asp Gly Glu Ile Gln Glu Gln His Ile
 1875 1880 1885

Tyr Ile Asn Gly Lys Glu Tyr Thr Ser Phe Asn Asp Ile Lys Gln Ile
 1890 1895 1900

Ile Asp Lys Thr Leu Asn Ile Lys Ile Val Val Lys Asp Phe Ala Arg
 1905 1910 1915 1920

Asn Thr Thr Val Lys Glu Phe Ile Leu Asn Lys Asp Thr Gly Glu Val
 1925 1930 1935

Ser Glu Leu Lys Pro His Arg Val Thr Val Thr Ile Gln Asn Gly Lys
 1940 1945 1950

Glu Met Ser Ser Thr Ile Val Ser Glu Glu Asp Phe Ile Leu Pro Val
 1955 1960 1965

Tyr Lys Gly Glu Leu Glu Lys Gly Tyr Gln Phe Asp Gly Trp Glu Ile
 1970 1975 1980

Ser Gly Phe Glu Gly Lys Lys Asp Ala Gly Tyr Val Ile Asn Leu Ser
 1985 1990 1995 2000

Lys Asp Thr Phe Ile Lys Pro Val Phe Lys Lys Ile Glu Glu Lys Lys
 2005 2010 2015

Glu Glu Glu Asn Lys Pro Thr Phe Asp Val Ser Lys Lys Lys Asp Asn
 2020 2025 2030

Pro Gln Val Asn His Ser Gln Leu Asn Glu Ser His Arg Lys Glu Asp
 2035 2040 2045

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caacttcaat	attttatgaa	aaatctgcca	gctgagtttg	cccgttacag	tgagcaacaa	360
gtcagcgact	acctagctct	caatgcagg	ttggttgcca	tgaacttggt	tcttgcat	420
acagaccaag	gaattggttc	taacattatt	cttggttttg	acaaatcaaa	agttaatgaa	480
gttttgga	tcgaagaccg	tttccgcca	gaactcttga	tcacagtggg	ttatacagac	540
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<213> Streptococcus pneumoniae

Val Leu Glu Ile Glu Asp Arg Phe Arg Pro Glu Leu Leu Ile Thr Val
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Gly Tyr Thr Asp Glu Lys Leu Glu Pro Ser Tyr Arg Leu Pro Val Asp
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Glu Ile Ile Glu Lys Arg
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<210> 31

<211> 1401

<212> DNA

<213> Streptococcus pneumoniae

<400> 31

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 ccaatttgggc ctggtccagt aaaagccttg gagaaattcc ttgaaatcgc agaccgcgat 180
 ggctacccaa ctaagaatgt tgataactat gcaggacatt ttgagtttgg tgatggagaa 240
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 gacccttaca caccaactat caaagatggt cgcctttatg cgcgcggggc ttcggacgat 360
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 gactactact ttgagcacgt aggacttgcc aaaccagatt tcggtttctc accagatgct 540
 gaatttccaa tcatcaatgg tgaaaaagga aatatcacgg aatacctcca ctttgacgga 600
 gaaaatacag gtgttgcccg tcttcacagc ttacaggtg gtttacgtga aaatatggtg 660
 ccagaatcag caacagcagt cgtttcaggt gacttggtg acttgcaagc taaactagat 720
 gcctttgttg cagaacacaa acttagagga gaactccaag aagaagctgg caaatacaag 780
 gtgacgatca ttggtaaatc agcccacggt gctatgcctg cttcaggtgt caatggcgca 840
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 ctagaacgag gagttgccta cgggtgctatg ttcccagact cgattgatac catgcaccaa 1320
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 atttacgaat tgatcaaata a 1401

<213> Streptococcus pneumoniae

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35 40 45

50 55 60

65 70 75 80

85 90 95

100 105 110

115 120 125

130 135 140

145 150 155 160

Asp Tyr Tyr Phe Glu His Val Gly Leu Ala Lys Pro Asp Phe Gly Phe
 165 170 175

Ser Pro Asp Ala Glu Phe Pro Ile Ile Asn Gly Glu Lys Gly Asn Ile
 180 185 190

Thr Glu Tyr Leu His Phe Ala Gly Glu Asn Thr Gly Val Ala Arg Leu
 195 200 205

His Ser Phe Thr Gly Gly Leu Arg Glu Asn Met Val Pro Glu Ser Ala
 210 215 220

Thr Ala Val Val Ser Gly Asp Leu Ala Asp Leu Gln Ala Lys Leu Asp
 225 230 235 240

Ala Phe Val Ala Glu His Lys Leu Arg Gly Glu Leu Gln Glu Glu Ala
 245 250 255

Gly Lys Tyr Lys Val Thr Ile Ile Gly Lys Ser Ala His Gly Ala Met
 260 265 270

Pro Ala Ser Gly Val Asn Gly Ala Thr Tyr Leu Ala Leu Phe Leu Ser
 275 280 285

Gln Phe Gly Phe Ala Gly Pro Ala Lys Asp Tyr Leu Asp Ile Ala Gly
 290 295 300

Lys Ile Leu Leu Asn Asp His Glu Gly Glu Asn Leu Lys Ile Ala His
 305 310 315 320

Val Asp Glu Lys Met Gly Ala Leu Ser Met Asn Ala Gly Val Phe His
 325 330 335

Phe Asp Glu Thr Ser Ala Asp Asn Thr Ile Ala Leu Asn Ile Arg Tyr
 340 345 350

Pro Lys Gly Thr Ser Pro Glu Gln Ile Lys Ser Ile Leu Glu Asn Leu
 355 360 365

00760736-043604

Pro Val Val Ser Val Ser Leu Ser Glu His Gly His Thr Pro His Tyr
 370 375 380

Val Pro Met Glu Asp Pro Leu Val Gln Thr Leu Leu Asn Ile Tyr Glu
 385 390 395 400

Lys Gln Thr Gly Phe Lys Gly His Glu Gln Val Ile Gly Gly Gly Thr
 405 410 415

Phe Gly Arg Leu Leu Glu Arg Gly Val Ala Tyr Gly Ala Met Phe Pro
 420 425 430

Asp Ser Ile Asp Thr Met His Gln Ala Asn Glu Phe Ile Ala Leu Asp
 435 440 445

Asp Leu Phe Arg Ala Ala Ala Ile Tyr Ala Glu Ala Ile Tyr Glu Leu
 450 455 460

Ile Lys
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<210> 33

<211> 1617

<212> DNA

<213> Streptococcus pneumoniae

<400> 33

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 attgcatga atttagagcg gtttttgaaa ttgtcaatct accaaatgat tgtctggtgt 180
 gggataatat tccttgactg ggtagtgaat aattatcagg ttgaagtgat ccaagagttt 240
 aatctagaga ttcgaaatag agttgccaca gacatctcta actctaccta tcaagaattt 300
 catagtaaat catcaggaac atatctttcg tggctaaata atgatgttca gactttaaat 360
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 gttgtgactc ttaatcacta tcattggtca ttgactgtag ccaccttggt ttcattaatg 480
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<210> 34

<211> 538

<212> PRT

<213> Streptococcus pneumoniae

<400> 34

Met Tyr Thr Ile Ile Lys Ser Asn Ile Lys Lys Phe Ser Leu Leu Thr

1

5

10

15

Ile Phe Ile Val Ala Gly Gln Leu Leu Leu Ile Tyr Ala Ala Thr Ile

20

25

30

Asn Ala Leu Val Leu Asn Glu Leu Ile Ala Met Asn Leu Glu Arg Phe

35

40

45

Leu Lys Leu Ser Ile Tyr Gln Met Ile Val Trp Cys Gly Ile Ile Phe

50

55

60

Leu Asp Trp Val Val Lys Asn Tyr Gln Val Glu Val Ile Gln Glu Phe
65 70 75 80

Asn Leu Glu Ile Arg Asn Arg Val Ala Thr Asp Ile Ser Asn Ser Thr
85 90 95

Tyr Gln Glu Phe His Ser Lys Ser Ser Gly Thr Tyr Leu Ser Trp Leu
100 105 110

Asn Asn Asp Val Gln Thr Leu Asn Asp Gln Ala Phe Lys Gln Leu Phe
115 120 125

Leu Val Ile Lys Gly Ile Ser Gly Thr Ile Phe Ala Val Val Thr Leu
130 135 140

Asn His Tyr His Trp Ser Leu Thr Val Ala Thr Leu Phe Ser Leu Met
145 150 155 160

Ile Met Leu Leu Val Pro Lys Ile Phe Ala Ser Lys Met Arg Glu Val
165 170 175

Ser Leu Asn Leu Thr Asn Gln Asn Glu Ala Phe Leu Lys Ser Ser Glu
180 185 190

Thr Ile Leu Asn Gly Phe Asp Val Leu Ala Ser Leu Asn Leu Leu Tyr
195 200 205

Val Leu Pro Lys Lys Ile Lys Glu Ala Gly Ile Leu Leu Lys Met Val
210 215 220

Ile Gln Arg Lys Thr Thr Val Glu Thr Leu Ala Gly Ala Ile Ser Phe
225 230 235 240

Phe Leu Asn Ile Phe Phe Gln Ile Ser Leu Val Phe Leu Thr Gly Tyr
245 250 255

Leu Ala Ile Lys Gly Ile Val Lys Ile Gly Thr Ile Glu Ala Ile Gly
260 265 270

00760736-043604

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Ala Leu Thr Gly Val Ile Phe Thr Ala Leu Gly Glu Leu Gly Gly Gln  
      275                      280                      285
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Leu Ser Ser Ile Ile Gly Thr Lys Pro Ile Phe Leu Lys Leu Tyr Ser
 290 295 300

Ile Asn Pro Ile Glu Ser Asn Lys Met Asn Asp Ile Glu Pro Asn Glu
 305 310 315 320

Val Asn Arg Asp Phe Pro Leu Tyr Glu Ala Lys Asn Ile Cys Tyr Lys
 325 330 335

Tyr Gly Asp Lys Glu Ile Leu Lys Asn Leu Asn Phe Cys Phe Gln Arg
 340 345 350

Asn Glu Lys Tyr Leu Ile Leu Gly Glu Ser Gly Ser Gly Lys Ser Thr
 355 360 365

Leu Leu Lys Leu Leu Asn Gly Phe Leu Arg Asp Tyr Ser Gly Glu Leu
 370 375 380

Arg Phe Cys Gly Asp Asp Ile Lys Lys Thr Ser Tyr Leu Asn Met Val
 385 390 395 400

Ser Asn Val Leu Tyr Val Asp Gln Lys Ala Tyr Leu Phe Glu Gly Thr
 405 410 415

Ile Arg Asp Asn Ile Leu Leu Glu Glu Asn Tyr Thr Asp Glu Glu Ile
 420 425 430

Leu Gln Ser Leu Glu Gln Val Gly Leu Ser Val Lys Asp Phe Pro Asn
 435 440 445

Asn Ile Leu Asp Tyr Tyr Val Gly Asp Asp Gly Arg Leu Leu Ser Gly
 450 455 460

Gly Gln Lys Gln Lys Ile Thr Leu Ala Arg Gly Leu Ile Arg Asn Lys
 465 470 475 480

Lys Ile Val Leu Ile Asp Glu Gly Thr Ser Ala Ile Asp Arg Arg Thr
 485 490 495

Ser Leu Ala Ile Glu Arg Lys Ile Leu Asp Arg Glu Asp Leu Thr Val
 500 505 510

Ile Ile Val Thr His Ala Pro His Pro Glu Leu Lys Gln Tyr Phe Thr
 515 520 525

Lys Ile Tyr Gln Phe Pro Lys Asp Phe Ile
 530 535

<210> 35

<211> 705

<212> DNA

<213> Streptococcus pneumoniae

<400> 35

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 cgaaccaact cccttttgac taatgagcga tcaaatattg aaaaacaagc cctccaaacg 180
 gcagaaaaac aagaaatagc ccattttgca ggcagtctag tagaagaaag agaaactatt 240
 ttcattggac caggaacaac attagagttt tttgcgcgtg agttgcctat tgacaatatc 300
 cgcgtcgtaa ccaacagtct acctgttttt ctgattttta gcgaacgaaa attaacagat 360
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 ctacaaaatc tctctaattc ccaattttct aaagctttcg ttagctgtaa tggatttcaa 480
 aacggagctc tagctacttt tagcgaggaa gagggagagg ctcaacgcat cgcttttaaat 540
 aattctaata aaaaatattt actcgcagat catagcaagt tcaataagtt tgatttttat 600
 actttttata atgtatcaaa tcttgatact attgtttcag attctaaact aagtgattca 660
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<210> 36

<211> 234

<212> PRT

<213> Streptococcus pneumoniae

0079292200

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Ile Thr Val Lys Gln Ile Met Asp Glu Ile Ala Val Ser Asp Met Thr
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Ala Arg Arg Tyr Leu Gln Glu Leu Ala Asp Lys Asp Leu Leu Ile Arg
      20              25              30

Val His Gly Gly Ala Glu Lys Leu Arg Thr Asn Ser Leu Leu Thr Asn
      35              40              45

Glu Arg Ser Asn Ile Glu Lys Gln Ala Leu Gln Thr Ala Glu Lys Gln
      50              55              60

Glu Ile Ala His Phe Ala Gly Ser Leu Val Glu Glu Arg Glu Thr Ile
      65              70              75              80

Phe Ile Gly Pro Gly Thr Thr Leu Glu Phe Phe Ala Arg Glu Leu Pro
      85              90              95

Ile Asp Asn Ile Arg Val Val Thr Asn Ser Leu Pro Val Phe Leu Ile
      100              105              110

Leu Ser Glu Arg Lys Leu Thr Asp Leu Ile Leu Ile Gly Gly Asn Tyr
      115              120              125

Arg Asp Ile Thr Gly Ala Phe Val Gly Thr Leu Thr Leu Gln Asn Leu
      130              135              140

Ser Asn Leu Gln Phe Ser Lys Ala Phe Val Ser Cys Asn Gly Ile Gln
      145              150              155              160

Asn Gly Ala Leu Ala Thr Phe Ser Glu Glu Glu Gly Glu Ala Gln Arg
      165              170              175

Ile Ala Leu Asn Asn Ser Asn Lys Lys Tyr Leu Leu Ala Asp His Ser
      180              185              190

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Lys Phe Asn Lys Phe Asp Phe Tyr Thr Phe Tyr Asn Val Ser Asn Leu
 195 200 205

Asp Thr Ile Val Ser Asp Ser Lys Leu Ser Asp Ser Ile Leu Phe Lys
 210 215 220

Leu Ser Lys His Ile Lys Val Ile Lys Pro
 225 230

<210> 37

<211> 483

<212> DNA

<213> Streptococcus pneumoniae

<400> 37

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 caatccatct ttatcgaaca caagggaat tatgcttata gccgggttca tttagaacta 180
 agaaatcgtg gttatctggt aaatcataaa agagttcaag gcttgatgaa agtactcaat 240
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 aaggcagaga atctcattca agcccaattt gaaggctcta aaacaatgga aaagtgtctac 360
 acagatgtga ctgaatttgc cattccagca agtactcaaa agctttactt atcaccagtt 420
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 taa 483

<210> 38

<211> 160

<212> PRT

<213> Streptococcus pneumoniae

<400> 38

Met Thr Glu Phe Ser Leu Asp Leu Leu Leu Glu Ala Ile Lys Leu Ala
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gaaaaaaaaatc	gottgcttgc	agcagggaat	gactttaact	ttgtaaccaa	tgtggatgat	180

attttatcag accaggatat tactatcgta gtggaattga tggggcgat tgagcctgct 240
 aaaaccttta tcaactcgtgc cttggaagct ggaaaacacg ttgttactgc taacaaggac 300
 ctttttagctg tccatggcgc agaattgcta gaaatcgctc aagctaacaa ggtagcactt 360
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<210> 40

<211> 421

<212> PRT

<213> Streptococcus pneumoniae

<400> 40

Pro Gly Phe Gly Thr Val Ala Ser Gly Val Pro Phe Leu Leu Lys Glu

1

5

10

15

Asn Gly Gly Lys Ile Asn Gln Ser Ala His Ser Asp Ile Lys Val Ala

20

25

30

Lys Val Leu Val Lys Asp Glu Asp Glu Lys Asn Arg Leu Leu Ala Ala

35

40

45

Gly Asn Asp Phe Asn Phe Val Thr Asn Val Asp Asp Ile Leu Ser Asp

50

55

60

Val Thr Pro Thr Phe Leu Pro Lys Ala His Pro Leu Ala Ser Val Asn
260 265 270

atgaaacacc tattatctta cttcaaacc tacatcaagg aatcaatttt agcccccttg 60
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 gtttttggtg ccatttttat ggcttatcga atctcagctg agttgacttt ctggttctta 480
 gtcttggttg ccattttgac cattgtcatt gtagggttat ctcgattggt caatcctttc 540
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<210> 42

<211> 574

<212> PRT

<213> *Streptococcus pneumoniae*

<400> 42

Met Lys His Leu Leu Ser Tyr Phe Lys Pro Tyr Ile Lys Glu Ser Ile

1

5

10

15

Leu Ala Pro Leu Phe Lys Leu Leu Glu Ala Val Phe Glu Leu Leu Val
 20 25 30

Pro Met Val Ile Ala Gly Ile Val Asp Gln Ser Leu Pro Gln Gly Asp
 35 40 45

Gln Gly His Leu Trp Met Gln Ile Gly Leu Leu Leu Ile Phe Ala Val
 50 55 60

Ile Gly Val Leu Val Ala Leu Ile Ala Gln Phe Tyr Ser Ala Lys Ala
 65 70 75 80

Ala Val Gly Ser Ala Lys Glu Leu Thr Asn Asp Leu Tyr Arg His Ile
 85 90 95

Leu Ser Leu Pro Lys Asp Ser Arg Asp Arg Leu Thr Thr Ser Ser Leu
 100 105 110

Val Thr Arg Leu Thr Ser Asp Thr Tyr Gln Ile Gln Thr Gly Ile Asn
 115 120 125

Gln Phe Leu Arg Leu Phe Leu Arg Ala Pro Ile Ile Val Phe Gly Ala
 130 135 140

Ile Phe Met Ala Tyr Arg Ile Ser Ala Glu Leu Thr Phe Trp Phe Leu
 145 150 155 160

Val Leu Val Ala Ile Leu Thr Ile Val Ile Val Gly Leu Ser Arg Leu
 165 170 175

Val Asn Pro Phe Tyr Ser Ser Leu Arg Lys Lys Thr Asp Gln Leu Val
 180 185 190

Gln Glu Thr Arg Gln Gln Leu Gln Gly Met Arg Val Ile Arg Ala Phe
 195 200 205

Gly Gln Glu Lys Arg Glu Leu Gln Ile Phe Gln Thr Leu Asn Gln Val
 210 215 220

```

Tyr Ala Arg Leu Gln Glu Lys Thr Gly Phe Trp Ser Ser Leu Leu Thr
225                230                235                240

Pro Leu Thr Tyr Leu Ile Val Asn Gly Thr Leu Leu Val Ile Ile Trp
245                250                255

Gln Gly Tyr Ile Ser Ile Gln Gly Gly Val Leu Ser Gln Gly Ala Leu
260                265                270

Ile Ala Leu Ile Asn Tyr Leu Leu Gln Ile Leu Val Glu Leu Val Lys
275                280                285

Leu Ala Met Leu Ile Asn Ser Leu Asn Gln Ser Tyr Ile Ser Val Lys
290                295                300

Arg Ile Glu Glu Val Phe Val Glu Ala Pro Glu Asp Ile His Ser Glu
305                310                315                320

Leu Glu Gln Lys Gln Ala Thr Arg Asp Lys Val Leu Gln Val Gln Glu
325                330                335

Leu Thr Phe Thr Tyr Pro Asp Ala Ala Gln Pro Ser Leu Arg Tyr Ile
340                345                350

Ser Phe Asp Met Thr Gln Gly Gln Ile Leu Gly Ile Ile Gly Gly Thr
355                360                365

Gly Ser Gly Lys Ser Ser Leu Val Gln Leu Leu Leu Gly Leu Tyr Pro
370                375                380

Val Asp Lys Gly Asn Ile Asp Leu Tyr Gln Asn Gly Arg Ser Pro Leu
385                390                395                400

Asn Leu Glu Gln Trp Arg Ser Trp Ile Ala Tyr Val Pro Gln Lys Val
405                410                415

Glu Leu Phe Lys Gly Thr Ile Arg Ser Asn Leu Thr Leu Gly Phe Asn
420                425                430

```

Gln Glu Val Ser Asp Gln Glu Leu Trp Gln Ala Leu Glu Ile Ala Gln
 435 440 445

Ala Lys Asp Phe Val Ser Glu Lys Glu Gly Leu Leu Asp Ala Leu Val
 450 455 460

Glu Ala Gly Gly Arg Asn Phe Ser Gly Gly Gln Lys Gln Arg Leu Ser
 465 470 475 480

Ile Ala Arg Ala Val Leu Arg Gln Ala Pro Phe Leu Ile Leu Asp Asp
 485 490 495

Ala Thr Ser Ala Leu Asp Thr Ile Thr Glu Ser Lys Leu Leu Lys Ala
 500 505 510

Ile Arg Glu Asn Phe Pro Asn Thr Ser Leu Ile Leu Ile Ser Gln Arg
 515 520 525

Thr Ser Thr Leu Gln Met Ala Asp Gln Ile Leu Leu Leu Glu Lys Gly
 530 535 540

Glu Leu Leu Ala Val Gly Lys His Asp Asp Leu Met Lys Ser Ser Gln
 545 550 555 560

Val Tyr Cys Glu Ile Asn Ala Ser Gln His Gly Lys Glu Asp
 565 570

<210> 43

<211> 1224

<212> DNA

<213> Streptococcus pneumoniae

<400> 43

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 ctgcccattt tagggcagca ggtcgcctgg attgccttgg ggcttgtgat tggttttgtg 180

```
<210> 44
<211> 407
<212> PRT
<213> Streptococcus pneumoniae
```

Met Lys Arg Ser Leu Asp Ser Arg Val Asp Tyr Ser Leu Leu Leu Pro

Val Phe Phe Leu Leu Val Ile Gly Val Val Ala Ile Tyr Ile Ala Val

Ser His Asp Tyr Pro Asn Asn Ile Leu Pro Ile Leu Gly Gln Gln Val

Ala Trp Ile Ala Leu Gly Leu Val Ile Gly Phe Val Val Met Leu Phe

50 55 60

Gln Ile Ala Ile Gly Ser Gly Gly Leu Phe Gly Gln Gly Phe Asn Ala
260 265 270

Ser Asn Leu Leu Ile Pro Val Arg Glu Ser Asp Met Ile Phe Thr Val
 275 280 285

Ile Ala Glu Asp Phe Gly Phe Ile Gly Ser Val Leu Val Ile Ala Leu
 290 295 300

Tyr Leu Met Leu Ile Tyr Arg Met Leu Lys Ile Thr Leu Lys Ser Asn
 305 310 315 320

Asn Gln Phe Tyr Thr Tyr Ile Ser Thr Gly Leu Ile Met Met Leu Leu
 325 330 335

Phe His Ile Phe Glu Asn Ile Gly Ala Val Thr Gly Leu Leu Pro Leu
 340 345 350

Thr Gly Ile Pro Leu Pro Phe Ile Ser Gln Gly Gly Ser Ala Ile Ile
 355 360 365

Ser Asn Leu Ile Gly Val Gly Leu Leu Leu Ser Met Ser Tyr Gln Thr
 370 375 380

Asn Leu Ala Glu Glu Lys Ser Gly Lys Val Pro Phe Lys Arg Lys Lys
 385 390 395 400

Val Val Leu Lys Gln Ile Lys
 405

<210> 45

<211> 1104

<212> DNA

<213> Streptococcus pneumoniae

<400> 45

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 gagaagattc tatcaaccat tgtttcaaat ctggatccag aaaagtatga tattgatatt 120
 cttgaaatgg agcactttga caagggatat gaatctgttc caaagcatgt acgcatttta 180


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aaatcccttc aagattatcg ccaaaccaga tggttacgag cttttttgtg gagaatgaga 240
atattttttc caagactgac tcgtcgtttg cttgtaaaag atgattatga tgttgaagtt 300
tctttttacca ttatgaatcc accactgttg ttctctaaaa gaagagaagt caagaagata 360
tcttggattc atggaagtat tgaagaactt ctttaaggata gctctaaaag agaatcacat 420
agaagccagt tggatgctgc gaatacaatt gtagggattt caaaaaagac cagcaattct 480
atcaaggaag tttatccaga ttatacttct aaattacaga caatctacaa tggatatgat 540
tttcagacta ttctagaaaa atctcaagag aagatcgata tcgagattgc tcctcaaagt 600
atctgtacta tcggacggat tgaggaaaat aagggttctg accgtgtagt ggaagtgata 660
cgattattac accaagaggg aaaaaactat catctctatt ttatcggggc tggatgatag 720
gaagaggaac tgaaaaaacg agtcaaagag tatgggattg aggactatgt acatttcctt 780
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aaacaagaag gttttccttg agtgtatgtg gaggccttga gtctgggact cccttttatc 900
tctacggacg ttggaggggc tgaggaatta tccaagaag gacgatttgg acaaatcatt 960
gagagcaatc aagaggcagc tcaggcgatt actaattaca tgacttctgc ctcaaacttt 1020
gatgtcgatg aggctagcca attcattcaa caatttaca ttacaaaaca aatcgaacaa 1080
gtagaaaaac tattagagga gtag                                     1104

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<210> 46

<211> 367

<212> PRT

<213> Streptococcus pneumoniae

<400> 46

```

Met Val Ala Lys Lys Lys Ile Leu Phe Phe Met Trp Ser Phe Ser Leu
  1             5             10             15

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```

Gly Gly Gly Ala Glu Lys Ile Leu Ser Thr Ile Val Ser Asn Leu Asp
      20             25             30

```

```

Pro Glu Lys Tyr Asp Ile Asp Ile Leu Glu Met Glu His Phe Asp Lys
      35             40             45

```

```

Gly Tyr Glu Ser Val Pro Lys His Val Arg Ile Leu Lys Ser Leu Gln
      50             55             60

```

```

Asp Tyr Arg Gln Thr Arg Trp Leu Arg Ala Phe Leu Trp Arg Met Arg
      65             70             75             80

```

Thr Lys Val Leu Leu Ser Met Ser Lys Gln Glu Gly Phe Pro Gly Val
275 280 285

<400> 47							
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gatggtgcaa	cagatgaaag	tggtcgcttg	tgtgattcaa	tcgctgaaca	agatgacagg	180	
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caggctcacg	gggattatct	gattttttatt	gactcagatg	attatatcca	tccagaaatg	300	
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actaaaccct	attattacta	tttccataga	ggggatagta	ttacgaccaa	accctatgca	660	
gagaaggatt	tagcctatat	tgatatctac	caaaagtttt	ataatgaagt	tgtgaaaaac	720	
tatcctgact	tgaaagaggt	cgcttttttc	agattggcct	atgccactt	ctttattctg	780	
gataagatgt	tgctagatga	tcagtataaa	cagtttgaag	cctattctca	gattcatcgt	840	
tttttaaaag	gccatgcctt	tgctatttct	aggaatccaa	ttttccgtaa	ggggagaaga	900	

```
<210> 48
<211> 328
<212> PRT
<213> Streptococcus pneumoniae
```

Met Glu Thr Ala Leu Ile Ser Val Ile Val Pro Val Tyr Asn Val Ala

1 5 10 15

Asn Leu Glu Ile Ile Leu Val Asp Asp Gly Ala Thr Asp Glu Ser Gly
35 40 45

His Lys Lys Asn Glu Gly Leu Ser Gln Ala Arg Asn Asp Gly Met Lys
65 70 75 80

His Pro Glu Met Ile Gln Ser Leu Tyr Glu Gln Leu Val Gln Glu Asp
100 105 110

Ala Asp Val Ser Ser Cys Gly Val Met Asn Val Tyr Ala Asn Asp Glu
115 120 125

Ser Pro Gln Ser Ala Asn Gln Asp Asp Tyr Phe Val Cys Asp Ser Gln
130 135 140

Thr Phe Leu Lys Glu Tyr Leu Ile Gly Glu Lys Ile Pro Gly Thr Ile
145 150 155 160

Cys Asn Lys Leu Ile Lys Arg Gln Ile Ala Thr Ala Leu Ser Phe Pro
165 170 175

Lys Gly Leu Ile Tyr Glu Asp Ala Tyr Tyr His Phe Asp Leu Ile Lys
180 185 190

Leu Ala Lys Lys Tyr Val Val Asn Thr Lys Pro Tyr Tyr Tyr Tyr Phe
195 200 205

His Arg Gly Asp Ser Ile Thr Thr Lys Pro Tyr Ala Glu Lys Asp Leu
210 215 220

Ala Tyr Ile Asp Ile Tyr Gln Lys Phe Tyr Asn Glu Val Val Lys Asn
225 230 235 240

Tyr Pro Asp Leu Lys Glu Val Ala Phe Phe Arg Leu Ala Tyr Ala His
245 250 255

Phe Phe Ile Leu Asp Lys Met Leu Leu Asp Asp Gln Tyr Lys Gln Phe
260 265 270

Glu Ala Tyr Ser Gln Ile His Arg Phe Leu Lys Gly His Ala Phe Ala
275 280 285

Ile Ser Arg Asn Pro Ile Phe Arg Lys Gly Arg Arg Ile Ser Ala Leu
290 295 300

Ala Leu Phe Ile Asn Ile Ser Leu Tyr Arg Phe Leu Leu Leu Lys Asn
305 310 315 320

Ile Glu Lys Ser Lys Lys Leu His
325

109210-924920

<210> 49

<211> 735

<212> DNA

<213> Streptococcus pneumoniae

<400> 49

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ggtctagcag ggagaaatgg agttggtaag agtacgttga tgaaaattct tgttcagaat 180
aatcaaccga cttcaggtaa tattataagc agtgataatg ttgggtatgt aatcgaagaa 240
ccaaaattat ttttatctaa aacagggtta gagaatttaa aatatttgtc aaatttatat 300
ggtgttgact acaatcaaga aagattttaga tgtttgatcc aagagttaga tttgactcag 360
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ctaactctcg ttacggaacc tgatatattg attttagatg aaccgactaa tggtttagat 480
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ttcttgagaa acgggctttt gacatttcaa aaagtaggaa aagatagtca taatttcttg 660
tttgagatag ctttttcatt agctacagat agagacattt tcattaccaa acaagaattt 720
tgggatattg ttttag                                     735

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<210> 50

<211> 244

<212> PRT

<213> Streptococcus pneumoniae

<400> 50

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Met Arg Ile Lys Glu Lys Thr Asn Asn Ile Asn Gly Gly Ile Lys Asn
  1              5              10              15

Val Ser Lys His Tyr Gly His Ser Ile Ile Leu Lys Asp Ile Asn Phe
          20              25              30

Ala Leu Asn Lys Gly Glu Ile Val Gly Leu Ala Gly Arg Asn Gly Val
          35              40              45

Gly Lys Ser Thr Leu Met Lys Ile Leu Val Gln Asn Asn Gln Pro Thr
          50              55              60

```

Ser Gly Asn Ile Ile Ser Ser Asp Asn Val Gly Tyr Leu Ile Glu Glu
65 70 75 80

Pro Lys Leu Phe Leu Ser Lys Thr Gly Leu Glu Asn Leu Lys Tyr Leu
85 90 95

Ser Asn Leu Tyr Gly Val Asp Tyr Asn Gln Glu Arg Phe Arg Cys Leu
100 105 110

Ile Gln Glu Leu Asp Leu Thr Gln Ser Ile Asn Lys Lys Val Lys Thr
115 120 125

Tyr Ser Leu Gly Thr Lys Gln Lys Leu Ala Leu Leu Thr Leu Val
130 135 140

Thr Glu Pro Asp Ile Leu Ile Leu Asp Glu Pro Thr Asn Gly Leu Asp
145 150 155 160

Ile Glu Ser Ser Gln Ile Val Leu Ala Val Leu Lys Lys Leu Ala Leu
165 170 175

His Glu Asn Val Gly Ile Leu Ile Ser Ser His Lys Leu Glu Asp Ile
180 185 190

Glu Glu Ile Cys Glu Arg Val Leu Phe Leu Glu Asn Gly Leu Leu Thr
195 200 205

Phe Gln Lys Val Gly Lys Asp Ser His Asn Phe Leu Phe Glu Ile Ala
210 215 220

Phe Ser Ser Ala Thr Asp Arg Asp Ile Phe Ile Thr Lys Gln Glu Phe
225 230 235 240

Trp Asp Ile Val

<210> 51

<211> 1704

<212> DNA

<213> Streptococcus pneumoniae

<400> 51

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ggagtgattt cgacttgggc ggaaaataca ccatgtaaca ttcacttgca tgatttcggg 180
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accgtagcgg acgggatcgc tatgggaacg cctggtatgc gtttctctct aacatctcgt 300
gacatcatcg cggactccat cgaggcggct atgagtggtc acaacgtgga tgccttcgtc 360
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<211> 567

<213> Streptococcus pneumoniae

Met Thr Glu Leu Asp Lys Arg His Arg Ser Ser Ile Tyr Asp Ser Met

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35 40 45

50 55 60

65 70 75 80

85 90 95

100 105 110

115 120 125

130 135 140

145 150 155 160

165 170 175

Asp Met Thr Ala Glu Asp Val Lys Arg Leu Glu Cys Asn Ala Cys Pro
 180 185 190

Gly Pro Gly Gly Cys Gly Gly Met Tyr Thr Ala Asn Thr Met Ala Thr
 195 200 205

Ala Ile Glu Val Leu Gly Met Ser Leu Pro Gly Ser Ser Ser His Pro
 210 215 220

Ala Glu Ser Ala Asp Lys Lys Glu Asp Ile Glu Ala Ala Gly Arg Ala
 225 230 235 240

Val Val Lys Met Leu Glu Leu Gly Leu Lys Pro Ser Asp Ile Leu Thr
 245 250 255

Arg Glu Ala Phe Glu Asp Ala Ile Thr Val Thr Met Ala Leu Gly Gly
 260 265 270

Ser Thr Asn Ala Thr Leu His Leu Leu Ala Ile Ala His Ala Ala Asn
 275 280 285

Val Asp Leu Ser Leu Glu Asp Phe Asn Thr Ile Gln Glu Arg Val Pro
 290 295 300

His Leu Ala Asp Leu Lys Pro Ser Gly Gln Tyr Val Phe Gln Asp Leu
 305 310 315 320

Tyr Glu Val Gly Gly Val Pro Ala Val Met Lys Tyr Leu Leu Ala Asn
 325 330 335

Gly Phe Leu His Gly Asp Arg Ile Thr Cys Thr Gly Lys Thr Val Ala
 340 345 350

Glu Asn Leu Ala Asp Phe Ala Asp Leu Thr Pro Gly Gln Lys Val Ile
 355 360 365

Met Pro Leu Glu Asn Pro Lys Arg Ala Asp Gly Pro Leu Ile Ile Leu
 370 375 380

Met Asp Lys Ser Gly Lys Lys
565

<210> 53

<211> 274

<212> DNA

<213> Streptococcus pneumoniae

<400> 53

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 ggatattctt gcaagatact atcgtcagaa gggagaggaa gttttatatg tttctggaag 180
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 aattgctgat ttttatcata aggaatttaa tcca 274

<210> 54

<211> 91

<212> PRT

<213> Streptococcus pneumoniae

<400> 54

Cys Tyr Asn Lys Asn Lys Glu Phe Lys Glu Lys Tyr Asn Met Ser Ile
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Phe Ile Gly Gly Ala Trp Pro Tyr Ala Asn Gly Ser Leu His Ile Gly
 20 25 30

His Ala Ala Ala Leu Leu Pro Gly Asp Ile Leu Ala Arg Tyr Tyr Arg
 35 40 45

Gln Lys Gly Glu Glu Val Leu Tyr Val Ser Gly Ser Asp Cys Asn Gly
 50 55 60

Thr Pro Ile Ser Ile Arg Ala Lys Lys Glu Asn Lys Ser Val Lys Glu
 65 70 75 80

Ile Ala Asp Phe Tyr His Lys Glu Phe Asn Pro
 85 90

<210> 55

<211> 1065

<212> DNA

<213> Streptococcus pneumoniae

<400> 55

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aagaaattgg atcgttcaac ggttgatttg attaaacatt attaa 1065

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<210> 56

<211> 354

<212> PRT

<213> Streptococcus pneumoniae

<400> 56

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Met Thr Thr Leu Phe Ser Lys Ile Lys Glu Val Thr Glu Leu Ala Ala
  1             5             10             15

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Val Ser Gly His Glu Ala Pro Val Arg Ala Tyr Leu Arg Glu Lys Leu
      20             25             30

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Thr Pro His Val Asp Glu Val Val Thr Asp Gly Leu Gly Gly Ile Phe
 35 40 45

Gly Ile Lys His Ser Glu Ala Val Asp Ala Pro Arg Val Leu Val Ala
 50 55 60

Ser His Met Asp Glu Val Gly Phe Met Val Ser Glu Ile Lys Pro Asp
 65 70 75 80

Gly Thr Phe Arg Val Val Glu Ile Gly Gly Trp Asn Pro Met Val Val
 85 90 95

Ser Ser Gln Arg Phe Lys Leu Leu Thr Arg Asp Gly His Glu Ile Pro
 100 105 110

Val Ile Ser Gly Ser Val Pro Pro His Leu Thr Arg Gly Lys Gly Gly
 115 120 125

Pro Thr Met Pro Ala Ile Ala Asp Ile Val Phe Asp Gly Gly Phe Ala
 130 135 140

Asp Lys Ala Glu Ala Glu Ser Phe Gly Ile Arg Pro Gly Asp Thr Ile
 145 150 155 160

Val Pro Asp Ser Ser Ala Ile Leu Thr Ala Asn Glu Lys Asn Ile Ile
 165 170 175

Ser Lys Ala Trp Asp Asn Arg Tyr Gly Val Leu Met Val Ser Glu Leu
 180 185 190

Ala Glu Ala Leu Ser Gly Gln Lys Leu Gly Asn Glu Leu Tyr Leu Gly
 195 200 205

Ser Asn Val Gln Glu Glu Val Gly Leu Arg Gly Ala His Thr Ser Thr
 210 215 220

Thr Lys Phe Asp Pro Glu Val Phe Leu Ala Val Asp Cys Ser Pro Ala
 225 230 235 240

Gly Asp Val Tyr Gly Gly Gln Gly Lys Ile Gly Asp Gly Thr Leu Ile
245 250 255

Arg Phe Tyr Asp Pro Gly His Leu Leu Leu Pro Gly Met Lys Asp Phe
260 265 270

Leu Leu Thr Thr Ala Glu Glu Ala Gly Ile Lys Tyr Gln Tyr Tyr Cys
275 280 285

Gly Lys Gly Gly Thr Asp Ala Gly Ala Ala His Leu Lys Asn Gly Gly
290 295 300

Val Pro Ser Thr Thr Ile Gly Val Cys Ala Arg Tyr Ile His Ser His
305 310 315 320

Gln Thr Leu Tyr Ala Met Asp Asp Phe Leu Glu Ala Gln Ala Phe Leu
325 330 335

Gln Ala Leu Val Lys Lys Leu Asp Arg Ser Thr Val Asp Leu Ile Lys
340 345 350

His Tyr

<210> 57

<211> 1182

<212> DNA

<213> Streptococcus pneumoniae

<400> 57

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agcctatctc tgacttttat cctagccact cgtctccac tactagaaag ctggtttcac 180
agtttgga aggtctacac cgtccacaaa ttcacagcct ttctctcaat catcctacta 240
atctttcata actttagtat gggcggtttg tggggctctc gcttagctgc tcagtttggc 300
aatcttgcca tctatatctt tgccagcatc atccttgctg cctatttagg caaatacatc 360

caatacgaag cttggcgatg gattcaccgc ctgggttacc tagcctatat tttaggactc 420
 tttcacatct acatgataat gggcaatcgt ctcttacat ttaatcttct aagttttctt 480
 gttggtagct atgccctttt aggettacta gctgggtttt atatcatttt tctatatcaa 540
 aagatttcct tcccctatct agggaaaatt acccatctca aacgcttaaa tcacgatact 600
 agagaaattc aaatccatct tagcagacct ttcaactatc aatcaggaca atttgccttt 660
 ctaaagattt tccaagaagg ctttgaaagt gctccgcac ccttttctat ctccaggagt 720
 catggtcaaa ctctttactt tactgttaaa acttcaggcg accataccaa gaatatctat 780
 gataatcttc aagccggcag caaagtaacc ctagacagag cttacggaca catgatcata 840
 gaagaaggac gagaaaatca ggtttgatt gctggaggta ttgggatcac ccccttcac 900
 tcttacatcc gtgaacatcc tatttttagat aaacaggttc acttctacta tagcttccgt 960
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<210> 58

<211> 394

<212> PRT

<213> Streptococcus pneumoniae

<400> 58

Met Glu Phe Ser Met Lys Ser Val Lys Gly Leu Leu Phe Ile Ile Ala

1 5 10 15

Ser Phe Ile Leu Thr Leu Leu Thr Trp Met Asn Thr Ser Pro Gln Phe

20 25 30

Met Ile Pro Gly Leu Ala Leu Thr Ser Leu Ser Leu Thr Phe Ile Leu

35 40 45

Ala Thr Arg Leu Pro Leu Leu Glu Ser Trp Phe His Ser Leu Glu Lys

50 55 60

Val Tyr Thr Val His Lys Phe Thr Ala Phe Leu Ser Ile Ile Leu Leu

65 70 75 80

Arg Ala Tyr Gly His Met Ile Ile Glu Glu Gly Arg Glu Asn Gln Val
275 280 285

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cgcaataaaa	tcatgggaat	ttacacgact	gataaggagc	aaattgtctt	tatcgacaca	180
ccagggattc	acaagcctaa	aacagctctc	ggagatttca	tggttgagtc	tgccctacagt	240
acccttcgcg	aagtggacac	tgttcttttc	atggtgcctg	ctgatgaagc	gcgtggtaag	300
ggggacgata	tgattatcga	gcgtctcaag	gctgccaagg	ttcctgtgat	tttggtggtg	360
aataaaaatcg	ataaggtcca	tccagaccag	ctcttgtctc	agattgatga	cttccgtaat	420
caaatggact	ttaaggaaat	tgttccaatc	tcagcccttc	agggaaataa	cgtgtctcgt	480
ctagtggata	ttttgagtga	aaatctggat	gaaggtttcc	aatatttccc	gtctgatcaa	540

Lys Val Pro Val Ile Leu Val Val Asn Lys Ile Asp Lys Val His Pro
115 120 125

Leu Ala Asp Phe Gly Tyr Asn Glu Arg Glu Tyr
290 295

<210> 61

<211> 855

<212> DNA

<213> Streptococcus pneumoniae

<400> 61

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ctgcttcttg tttttacaga aggaggactt atgcctgaat tacctgaggt tgaaaccggt 60
tgctgtggct tagaaaaatt gattatagga aagaagattt cgagtataga aattcgctac 120
cccaagatga ttaagacgga tttggaagag tttcaaaggg aattgcctag tcagattatc 180
gagtcaatgg gacgtcgtgg aaaatatttg cttttttatc tgacagacaa ggtcttgatt 240
tcccatttgc ggatggaggg caagtatttt tactatccag accaaggacc tgaacgcaag 300
catgcccattg ttttctttca ttttgaagat ggtggcacgc ttgtttatga ggatgttcgc 360
aagtttggaa ccatggaact cttggtgcct gaccttttag acgtctactt tatttctaaa 420
aaattaggtc ctgaaccaag cgaacaagac tttgatttac aggtctttca atctgccctt 480
gccaagtcca aaaagcctat caaatcccat ctccatagacc agaccttggg agctggactt 540
ggcaatatct atgtggatga ggttctcttg cgagctcagg ttcattccagc tagaccttcc 600
cagactttga cagcagaaga agcgactgcc attcatgacc agaccattgc tgttttgggc 660
caggctgttg aaaaaggttg ctccaccatt cggacttata ccaatgcctt tggggaagat 720
ggaagcatgc aggactttca tcaggtctat gataagactg gtcaagaatg tgtacgctgt 780
ggtaccatca ttgagaaaat tcaactaggc ggacgtggaa cccacttttg tccaaactgt 840
caaaggaggg actga 855

```

<210> 62

<211> 284

<212> PRT

<213> Streptococcus pneumoniae

<400> 62

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Met Leu Leu Val Phe Thr Glu Gly Gly Leu Met Pro Glu Leu Pro Glu
  1             5             10            15

Val Glu Thr Val Cys Arg Gly Leu Glu Lys Leu Ile Ile Gly Lys Lys
    20             25            30

Ile Ser Ser Ile Glu Ile Arg Tyr Pro Lys Met Ile Lys Thr Asp Leu
    35             40            45

```

Glu Glu Phe Gln Arg Glu Leu Pro Ser Gln Ile Ile Glu Ser Met Gly
 50 55 60

Arg Arg Gly Lys Tyr Leu Leu Phe Tyr Leu Thr Asp Lys Val Leu Ile
 65 70 75 80

Ser His Leu Arg Met Glu Gly Lys Tyr Phe Tyr Tyr Pro Asp Gln Gly
 85 90 95

Pro Glu Arg Lys His Ala His Val Phe Phe His Phe Glu Asp Gly Gly
 100 105 110

Thr Leu Val Tyr Glu Asp Val Arg Lys Phe Gly Thr Met Glu Leu Leu
 115 120 125

Val Pro Asp Leu Leu Asp Val Tyr Phe Ile Ser Lys Lys Leu Gly Pro
 130 135 140

Glu Pro Ser Glu Gln Asp Phe Asp Leu Gln Val Phe Gln Ser Ala Leu
 145 150 155 160

Ala Lys Ser Lys Lys Pro Ile Lys Ser His Leu Leu Asp Gln Thr Leu
 165 170 175

Val Ala Gly Leu Gly Asn Ile Tyr Val Asp Glu Val Leu Trp Arg Ala
 180 185 190

Gln Val His Pro Ala Arg Pro Ser Gln Thr Leu Thr Ala Glu Glu Ala
 195 200 205

Thr Ala Ile His Asp Gln Thr Ile Ala Val Leu Gly Gln Ala Val Glu
 210 215 220

Lys Gly Gly Ser Thr Ile Arg Thr Tyr Thr Asn Ala Phe Gly Glu Asp
 225 230 235 240

Gly Ser Met Gln Asp Phe His Gln Val Tyr Asp Lys Thr Gly Gln Glu
 245 250 255

100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255

Cys Val Arg Cys Gly Thr Ile Ile Glu Lys Ile Gln Leu Gly Gly Arg
 260 265 270

Gly Thr His Phe Cys Pro Asn Cys Gln Arg Arg Asp
 275 280

<210> 63

<211> 633

<212> DNA

<213> Streptococcus pneumoniae

<400> 63

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 gccgacgcag tcgtccacca actacagaaa cctggtggtc gtctgtttga ggctctagta 180
 cagcactttg ggcaagaaat cattcttgaa aacggagaac tcaatcgccc tctcctagct 240
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 atggatatcc ccctactttt tgagcaggac tacagcgatt ggtttgctga gacttggttg 420
 gtctatgtgg accgagatgc ccaagtggaa cgcttaatga aaagggacca gttgtccaaa 480
 gatgaagctg agtctcgtct ggcagcccag tggccttttag aaaaaaagaa agatttggcc 540
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<210> 64

<211> 210

<212> PRT

<213> Streptococcus pneumoniae

<400> 64

Met Ser Lys Leu Ser Lys Glu Gly Leu Met Gly Lys Ile Ile Gly Ile
 1 5 10 15

Thr Gly Gly Ile Ala Ser Gly Lys Ser Thr Val Thr Asn Phe Leu Arg
 20 25 30

Arg Asp
210

<210> 65

<211> 1269

<212> DNA

<213> Streptococcus pneumoniae

<400> 65

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gctgctattt tgactatttg ctttatcaag gaagattttc aaccagtagc caaggaaaaag 660
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gaaatctag                                     1269

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<210> 66

<211> 422

<212> PRT

<213> Streptococcus pneumoniae

<400> 66

Met Ile Ile Met Ala Ile Arg Thr Ser Phe Leu Ile Lys Cys Ile Ser

1

5

10

15

Phe Leu Arg Glu Val Gly Lys Met Thr Glu Ile Asn Trp Lys Asp Asn
 20 25 30

Leu Arg Ile Ala Trp Phe Gly Asn Phe Leu Thr Gly Ala Ser Ile Ser
 35 40 45

Leu Val Val Pro Phe Met Pro Ile Phe Val Glu Asn Leu Gly Val Gly
 50 55 60

Ser Gln Gln Val Ala Phe Tyr Ala Gly Leu Ala Ile Ser Val Ser Ala
 65 70 75 80

Ile Ser Ala Ala Leu Phe Ser Pro Ile Trp Gly Ile Leu Ala Asp Lys
 85 90 95

Tyr Gly Arg Lys Pro Met Met Ile Arg Ala Gly Leu Ala Met Thr Ile
 100 105 110

Thr Met Gly Gly Leu Ala Phe Val Pro Asn Ile Tyr Trp Leu Ile Phe
 115 120 125

Leu Arg Leu Leu Asn Gly Val Phe Ala Gly Phe Val Pro Asn Ala Thr
 130 135 140

Ala Leu Ile Ala Ser Gln Val Pro Lys Glu Lys Ser Gly Ser Ala Leu
 145 150 155 160

Gly Thr Leu Ser Thr Gly Val Val Ala Gly Thr Leu Thr Gly Pro Phe
 165 170 175

Ile Gly Gly Phe Ile Ala Glu Leu Phe Gly Ile Arg Thr Val Phe Leu
 180 185 190

Leu Val Gly Ser Phe Leu Phe Leu Ala Ala Ile Leu Thr Ile Cys Phe
 195 200 205

Ile Lys Glu Asp Phe Gln Pro Val Ala Lys Glu Lys Ala Ile Pro Thr
 210 215 220

Lys Glu Leu Phe Thr Ser Val Lys Tyr Pro Tyr Leu Leu Leu Asn Leu			
225	230	235	240
Phe Leu Thr Ser Phe Val Ile Gln Phe Ser Ala Gln Ser Ile Gly Pro			
	245	250	255
Ile Leu Ala Leu Tyr Val Arg Asp Leu Gly Gln Thr Glu Asn Leu Leu			
	260	265	270
Phe Val Ser Gly Leu Ile Val Ser Ser Met Gly Phe Ser Ser Met Met			
	275	280	285
Ser Ala Gly Val Met Gly Lys Leu Gly Asp Lys Val Gly Asn His Arg			
	290	295	300
Leu Leu Val Val Ala Gln Phe Tyr Ser Val Ile Ile Tyr Leu Leu Cys			
305	310	315	320
Ala Asn Ala Ser Ser Pro Leu Gln Leu Gly Leu Tyr Arg Phe Leu Phe			
	325	330	335
Gly Leu Gly Thr Gly Ala Leu Ile Pro Gly Val Asn Ala Leu Leu Ser			
	340	345	350
Lys Met Thr Pro Lys Ala Gly Ile Ser Arg Val Phe Ala Phe Asn Gln			
	355	360	365
Val Phe Phe Tyr Leu Gly Gly Val Val Gly Pro Met Ala Gly Ser Ala			
	370	375	380
Val Ala Gly Gln Phe Gly Tyr His Ala Val Phe Tyr Ala Thr Ser Leu			
385	390	395	400
Cys Val Ala Phe Ser Cys Leu Phe Asn Leu Ile Gln Phe Arg Thr Leu			
	405	410	415
Leu Lys Val Lys Glu Ile			
	420		

<210> 67

<211> 1311

<212> DNA

<213> Streptococcus pneumoniae

<400> 67

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 cgtattttatg caacgggtga gtggctcaat cgttctttta gcatgattga tacaggagga 180
 attgatgatg tcgatgctcc tttcatggaa caaatcaagc accaggcaga aattgccatg 240
 gaagaagcag atgttatcgt ttttgtcgtg tctggtaagg aaggaattac tgatgcagac 300
 gaatacgtag ctcgtaagct ttataagacc cacaaaccag ttatcctcgc agtcaacaag 360
 gtggacaacc ctgagatgag aaatgatata tatgatttct atgctctcgg tttgggtgaa 420
 ccattgccta tctcatctgt ccatggaatc ggtacagggg atgtgctaga tgcgatcgta 480
 gaaaatcttc caaatgaata tgaggaagaa aatccagatg tcattaagtt tagcttgatt 540
 ggtcgtccta acgttgghaa atcaagcttg atcaatgcta tcttgggaga agaccgtgtt 600
 attgctagtc ctgttgctgg aacaactcgt gatgccattg ataccactt tacagatata 660
 gatggtcaag agtttaccat gattgatacg gctggtatgc gtaagtctgg taaggtttat 720
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 aaagataacc acactatgaa aaactgggaa gaagatatcc gtgagcagtt ccaatacctg 960
 ccttacgcac cgattatctt tgtatcagct ttaaccaagc aacgtctcca caaacttctt 1020
 gagatgatta agcaaatacag cgaaagtcaa aatacacgta ttccatcagc tgtcttgaa 1080
 gatgtcatca tggatgccat tgccatcaac ccaacaccga cagacaaagg aaaacgtctc 1140
 aagatTTTct atgcgaccca agtggcaacc aaaccaccaa cctttgtcat ctttgtcaat 1200
 gaagaagaac tcatgcactt ttcttacctg cgtttcttgg aaaatcaaat ccgcaaggcc 1260
 tttgtttttg agggaacacc gattcatctc atcgcaagaa aacgcaaata a 1311

<210> 68

<211> 436

<212> PRT

<213> Streptococcus pneumoniae

<400> 68

Met Ala Leu Pro Thr Ile Ala Ile Val Gly Arg Pro Asn Val Gly Lys

1

5

10

15

Ser Thr Leu Phe Asn Arg Ile Ala Gly Glu Arg Ile Ser Ile Val Glu
20 25 30

Asp Val Glu Gly Val Thr Arg Asp Arg Ile Tyr Ala Thr Gly Glu Trp
35 40 45

Leu Asn Arg Ser Phe Ser Met Ile Asp Thr Gly Gly Ile Asp Asp Val
50 55 60

Asp Ala Pro Phe Met Glu Gln Ile Lys His Gln Ala Glu Ile Ala Met
65 70 75 80

Glu Glu Ala Asp Val Ile Val Phe Val Val Ser Gly Lys Glu Gly Ile
85 90 95

Thr Asp Ala Asp Glu Tyr Val Ala Arg Lys Leu Tyr Lys Thr His Lys
100 105 110

Pro Val Ile Leu Ala Val Asn Lys Val Asp Asn Pro Glu Met Arg Asn
115 120 125

Asp Ile Tyr Asp Phe Tyr Ala Leu Gly Leu Gly Glu Pro Leu Pro Ile
130 135 140

Ser Ser Val His Gly Ile Gly Thr Gly Asp Val Leu Asp Ala Ile Val
145 150 155 160

Glu Asn Leu Pro Asn Glu Tyr Glu Glu Glu Asn Pro Asp Val Ile Lys
165 170 175

Phe Ser Leu Ile Gly Arg Pro Asn Val Gly Lys Ser Ser Leu Ile Asn
180 185 190

Ala Ile Leu Gly Glu Asp Arg Val Ile Ala Ser Pro Val Ala Gly Thr
195 200 205

Thr Arg Asp Ala Ile Asp Thr His Phe Thr Asp Thr Asp Gly Gln Glu
210 215 220

Phe Thr Met Ile Asp Thr Ala Gly Met Arg Lys Ser Gly Lys Val Tyr
225 230 235 240

Glu Asn Thr Glu Lys Tyr Ser Val Met Arg Ala Met Arg Ala Ile Asp
245 250 255

Arg Ser Asp Val Val Leu Met Val Ile Asn Ala Glu Glu Gly Ile Arg
260 265 270

Glu Tyr Asp Lys Arg Ile Ala Gly Phe Ala His Glu Ala Gly Lys Gly
275 280 285

Met Ile Ile Val Val Asn Lys Trp Asp Thr Leu Glu Lys Asp Asn His
290 295 300

Thr Met Lys Asn Trp Glu Glu Asp Ile Arg Glu Gln Phe Gln Tyr Leu
305 310 315 320

Pro Tyr Ala Pro Ile Ile Phe Val Ser Ala Leu Thr Lys Gln Arg Leu
325 330 335

His Lys Leu Pro Glu Met Ile Lys Gln Ile Ser Glu Ser Gln Asn Thr
340 345 350

Arg Ile Pro Ser Ala Val Leu Asn Asp Val Ile Met Asp Ala Ile Ala
355 360 365

Ile Asn Pro Thr Pro Thr Asp Lys Gly Lys Arg Leu Lys Ile Phe Tyr
370 375 380

Ala Thr Gln Val Ala Thr Lys Pro Pro Thr Phe Val Ile Phe Val Asn
385 390 395 400

Glu Glu Glu Leu Met His Phe Ser Tyr Leu Arg Phe Leu Glu Asn Gln
405 410 415

Ile Arg Lys Ala Phe Val Phe Glu Gly Thr Pro Ile His Leu Ile Ala
420 425 430

Arg Lys Arg Lys

435

<210> 69

<211> 714

<212> DNA

<213> Streptococcus pneumoniae

<400> 69

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aagaatttcc aatcctactc tgtgattgtg gtacgaagtc aagagaagaa agatgccttg 180
tatgaattgg tacctcaaga agccattcgc cagtctgctg ttttccttct ctttgtcgga 240
gatttgaacc gagcagaaaaa gggagcccga cttcataccg acaccttcca accccaaggt 300
gtggaaggtc tcttgattag ttcggtcgat gcagctcttg ctggacaaaa cgccttggtg 360
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gaagtggcag agctctttaa cctacctgac tacacctatt ctgtctttgg gatggcactg 480
ggtgtgccaa atcaacatca tgatatgaaa ccgagactgc cactagagaa tgttgtcttt 540
gaggaagaat accaagaaca gtcaactgag gcaatccaag cttatgaccg tgttcaggct 600
gactatgctg gggcgcgtgc gaccacaagc tggagtcagc gcctagcaga acagtttggt 660
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<210> 70

<211> 237

<212> PRT

<213> Streptococcus pneumoniae

<400> 70

Met Thr Glu Thr Ile Lys Leu Met Lys Ala His Thr Ser Val Arg Arg

1

5

10

15

Phe Lys Glu Gln Glu Ile Pro Gln Val Asp Leu Asn Glu Ile Leu Thr

20

25

30

Ser Ser Thr Arg Lys Asn Leu Glu Gln Lys Lys Leu Leu
225 230 235

<210> 71

<211> 729

<212> DNA

<213> Streptococcus pneumoniae

<400> 71

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ggaaagacca ccctctttaa tctaatacgt gggatttttag aagttcagtc agggagaatt 180
gtccttgatg gtgaagaaaa tccaagggg cgcgtgagtt atatgttgca aaaggatctg 240
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cggacctacc tttttgggca caagctcttt ctcttagatg aggccttttag cgccttggtat 480
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acaacctga tcatcacgca tagtattgag gaggccctca atctcagcga ccgtatctat 600
atcttgaaaa atogccctgg gcagattgtt tcagaaatta aactagattg gtctgaagat 660
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gataagtag                                     729

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<210> 72

<211> 242

<212> PRT

<213> Streptococcus pneumoniae

<400> 72

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Met Thr Glu Ile Arg Leu Glu His Val Ser Tyr Ala Tyr Gly Gln Glu
  1             5             10             15

```

```

Arg Ile Leu Glu Asp Ile Asn Leu Gln Val Thr Ser Gly Glu Val Val
      20             25             30

```

```

Ser Ile Leu Gly Pro Ser Gly Val Gly Lys Thr Thr Leu Phe Asn Leu
    35             40             45

```

Ile Ala Gly Ile Leu Glu Val Gln Ser Gly Arg Ile Val Leu Asp Gly
 50 55 60

Glu Glu Asn Pro Lys Gly Arg Val Ser Tyr Met Leu Gln Lys Asp Leu
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Leu Leu Glu His Lys Thr Val Leu Gly Asn Ile Ile Leu Pro Leu Leu
 85 90 95

Ile Gln Lys Val Asp Lys Ala Glu Ala Ile Ser Arg Ala Asp Lys Ile
 100 105 110

Leu Ala Thr Phe Gln Leu Thr Ala Val Arg Asp Lys Tyr Pro His Glu
 115 120 125

Leu Ser Gly Gly Met Arg Gln Arg Val Ala Leu Leu Arg Thr Tyr Leu
 130 135 140

Phe Gly His Lys Leu Phe Leu Leu Asp Glu Ala Phe Ser Ala Leu Asp
 145 150 155 160

Glu Met Thr Lys Met Glu Leu His Ala Trp Tyr Leu Glu Ile His Lys
 165 170 175

Gln Leu Gln Leu Thr Thr Leu Ile Ile Thr His Ser Ile Glu Glu Ala
 180 185 190

Leu Asn Leu Ser Asp Arg Ile Tyr Ile Leu Lys Asn Arg Pro Gly Gln
 195 200 205

Ile Val Ser Glu Ile Lys Leu Asp Trp Ser Glu Asp Glu Asp Lys Glu
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Asp Lys

<210> 73

<211> 2433

<212> DNA

<213> Streptococcus pneumoniae

<400> 73

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<213> Streptococcus pneumoniae

<400> 74

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Asp	Tyr	Pro	Tyr	Glu	Met	Asp	Arg	Leu	Glu	Glu	Val	Ala	Leu	Glu	Leu
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Ser	Arg	Arg	Leu	Gln	Val	Leu	Phe	Asp	Glu	Ala	Glu	Tyr	Val	Ala	Ser
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Val Val His Ala Lys Val Leu Gly Thr Glu His Val Leu Tyr Ala Ile
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Leu His Asp Ser Asn Ala Leu Ala Thr Arg Ile Leu Glu Arg Ala Gly
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Phe Ser Tyr Glu Asp Lys Lys Asp Gln Val Lys Ile Ala Ala Leu Arg
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Arg Asn Leu Glu Glu Arg Ala Gly Trp Thr Arg Glu Asp Leu Lys Ala
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Asn Met Met Gly Met Pro Gln Thr Pro Ser Gly Gly Leu Glu Asp Tyr
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Thr His Asp Leu Thr Glu Gln Ala Arg Ser Gly Lys Leu Glu Pro Val
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Val Val Ala Gly Thr Arg Phe Arg Gly Asp Phe Glu Glu Arg Met Asn
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Asn Ile Ile Lys Asp Ile Glu Glu Asp Gly Gln Val Ile Leu Phe Ile
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Asp Glu Leu His Thr Ile Met Gly Ser Gly Ser Gly Ile Asp Ser Thr
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Leu Asp Ala Ala Asn Ile Leu Lys Pro Ala Leu Ala Arg Gly Thr Leu
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Arg Thr Val Gly Ala Thr Thr Gln Glu Glu Tyr Gln Lys His Ile Glu
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Lys Asp Ala Ala Leu Ser Arg Arg Phe Ala Lys Val Thr Ile Glu Glu
355 360 365

Pro Ser Val Ala Asp Ser Met Thr Ile Leu Gln Gly Leu Lys Ala Thr
370 375 380

Tyr Glu Lys His His Arg Val Gln Ile Thr Asp Glu Ala Val Glu Thr
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Ala Val Lys Met Ala His Arg Tyr Leu Thr Ser Arg His Leu Pro Asp
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Ser Ala Ile Asp Leu Leu Asp Glu Ala Ala Ala Thr Val Gln Asn Lys
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Ala Lys His Val Lys Ala Asp Asp Ser Asp Leu Ser Pro Ala Asp Lys
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660 665 670

Lys Thr Val Gly Phe Gly Ala Lys Asp Ile Arg Phe Asp Gln Glu Asn
675 680 685

Met Glu Lys Arg Met Phe Glu Glu Leu Lys Lys Ala Tyr Arg Pro Glu
690 695 700

Phe Ile Asn Arg Ile Asp Glu Lys Val Val Phe His Ser Leu Ser Ser
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Ser Leu Thr Glu Lys Gly Ile Asp Leu Lys Leu Gln Ala Ser Ala Leu
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Lys Leu Leu Ala Asn Gln Gly Tyr Asp Pro Glu Met Gly Ala Arg Pro
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Leu Arg Arg Thr Leu Gln Thr Glu Val Glu Asp Lys Leu Ala Glu Leu
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<212> DNA

<213> Streptococcus pneumoniae

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<213> Streptococcus pneumoniae
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Lys Glu Ala Gly Val Asp Val Asp Leu Lys Leu Pro Pro Glu Glu Ser
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Gln Asp Tyr Met Ala Lys Lys Leu Glu Lys Gly Ala Gly Ile Thr Ala
100 105 110

Val Ala Ala Ile Val Glu His Asn Thr Ser Gly Ile Ile Ser Arg Lys
115 120 125

Ser Asp Asn Val Ser Ser Pro Lys Asp Leu Val Gly Lys Lys Tyr Gly
 130 135 140

Thr Trp Asn Asp Pro Thr Glu Leu Ala Met Leu Lys Thr Leu Val Glu
 145 150 155 160

Ser Gln Gly Gly Asp Phe Glu Lys Val Glu Lys Val Pro Asn Asn Asp
 165 170 175

Ser Asn Ser Ile Thr Pro Ile Ala Asn Gly Val Phe Asp Thr Ala Trp
 180 185 190

Ile Tyr Tyr Gly Trp Asp Gly Ile Leu Ala Lys Ser Gln Gly Val Asp
 195 200 205

Ala Asn Phe Met Tyr Leu Lys Asp Tyr Val Lys Glu Phe Asp Tyr Tyr
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Ser Pro Val Ile Ile Ala Asn Asn Asp Tyr Leu Lys Asp Asn Lys Glu
 225 230 235 240

Glu Ala Arg Lys Val Ile Gln Ala Ile Lys Lys Gly Tyr Gln Tyr Ala
 245 250 255

Met Glu His Pro Glu Glu Ala Ala Asp Ile Leu Ile Lys Asn Ala Pro
 260 265 270

Glu Leu Lys Glu Lys Arg Asp Phe Val Ile Glu Ser Gln Lys Tyr Leu
 275 280 285

Ser Lys Glu Tyr Ala Ser Asp Lys Glu Lys Trp Gly Gln Phe Asp Ala
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Ala Arg Trp Asn Ala Phe Tyr Lys Trp Asp Lys Glu Asn Gly Ile Leu
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<212> DNA

<213> Streptococcus pneumoniae

<400> 77

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<210> 78

<211> 253

<212> PRT

<213> Streptococcus pneumoniae

<400> 78

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20           25           30

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Leu Leu Pro Lys Phe Ile Leu Pro Thr Pro Leu Glu Ile Leu Gln Pro
35           40           45

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Phe Val Arg Asp Arg Glu Phe Leu Trp His His Ser Trp Ala Thr Leu
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Arg Val Ala Leu Leu Gly Leu Ile Leu Gly Val Leu Ile Ala Cys Leu
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Met Ala Val Leu Met Asp Ser Leu Thr Trp Leu Asn Asp Leu Ile Tyr
 85 90 95

Pro Met Met Val Val Ile Gln Thr Ile Pro Thr Ile Ala Ile Ala Pro
 100 105 110

Ile Leu Val Leu Trp Leu Gly Tyr Gly Ile Leu Pro Lys Ile Val Leu
 115 120 125

Ile Ile Leu Thr Thr Thr Phe Pro Ile Ile Val Ser Ile Leu Asp Gly
 130 135 140

Phe Arg His Cys Asp Lys Asp Met Leu Thr Leu Phe Ser Leu Met Arg
 145 150 155 160

Ala Lys Pro Trp Gln Ile Leu Trp His Phe Lys Ile Pro Val Ser Leu
 165 170 175

Pro Tyr Phe Tyr Ala Gly Leu Arg Val Ser Val Ser Tyr Ala Phe Ile
 180 185 190

Thr Thr Val Val Ser Glu Trp Leu Gly Gly Phe Glu Gly Leu Gly Val
 195 200 205

Tyr Met Ile Gln Ser Lys Lys Leu Phe Gln Tyr Asp Thr Met Phe Ala
 210 215 220

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<211> 372

<212> DNA

<213> Streptococcus pneumoniae

<400> 79

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<212> PRT

<213> Streptococcus pneumoniae

<400> 80

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Ile Val Thr Ser Leu Pro Asp Asp Ile Ile Asp Ser Phe Trp Tyr Ile
      35             40             45

Ile Asp His Phe Leu Lys Asn Val Phe Glu Leu Glu Glu Glu Leu Glu
      50             55             60

Phe Gln Leu Leu Asn Asn Gln Gly Lys Ile Thr Phe His Phe Ser Ser
      65             70             75             80

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110

Gln His Leu Pro Thr Ala Ile Asp Phe Asp Phe Asn His Pro Phe Asp
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Thr Ile Leu Leu Pro Glu Glu Asn Asp Leu Phe
115 120

<210> 81

<211> 1645

<212> DNA

<213> Streptococcus pneumoniae

<400> 81

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ctctaattca accactaatg gtttagataa ttcgttaagt gttaatagca tcagctctaa 360
tggtactatt cgttccaatt cacaattaga caacagaaca gttgaatcta cagtaacatc 420
tactaatgaa aataagagtt ataaggaaga tggtataagt gacagaatta tcaaaaaaga 480
atgtgaagat actgctttta gtgtaaaaga ttatggtgca gtaggtgatg ggattcatga 540
tgatcgacaa gcaattcaag atgcaataga tgctgcagct caagggctag gtggaggaaa 600
tgtatatttt cctgaaggaa cttatttagt aaaagaaatt gtttttttaa aaagtcatac 660
acacttagaa ttgaatgaga aagctacaat tctaaatggt ataaatatta agaatcacc 720
ttccattggt tttatgacag gtttatttac ggatgatggt gcgcaagtag aatggggccc 780
aacagaagat attagttatt ctggtggtac gattgatatg aacggtgctt tgaatgaaga 840
aggaaactaaa gcaaaaaatc taccacttat aaattcttca ggtgcatttg ctattgggaa 900
ttcaaataac gtaactataa aaaatgtaac attcaaggat agttatcaag ggcattgctat 960
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cacacactat caaacattgt cgacacagaa ccctctaat attaaaattc aaaataatca 1260

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 taatttagta gtctcagaga atagt 1645

<210> 82

<211> 548

<212> PRT

<213> Streptococcus pneumoniae

<400> 82

Gln Arg Cys His Ser Ile Tyr Phe Lys Lys Ser Asn Asn Gln Leu Leu
 1 5 10 15

Lys Ile Val Lys Lys Leu Glu Val Leu Met Lys Tyr Phe Val Pro Asn
 20 25 30

Glu Val Phe Ser Ile Arg Lys Leu Lys Val Gly Thr Cys Ser Val Leu
 35 40 45

Leu Ala Ile Ser Ile Leu Gly Ser Gln Gly Ile Leu Ser Asp Glu Val
 50 55 60

Val Thr Ser Ser Ser Pro Met Ala Thr Lys Glu Ser Ser Asn Ala Ile
 65 70 75 80

Thr Asn Asp Leu Asp Asn Ser Pro Thr Val Asn Gln Asn Arg Ser Ala
 85 90 95

Glu Met Ile Ala Ser Asn Ser Thr Thr Asn Gly Leu Asp Asn Ser Leu
 100 105 110

Ser Val Asn Ser Ile Ser Ser Asn Gly Thr Ile Arg Ser Asn Ser Gln
 115 120 125

Leu Asp Asn Arg Thr Val Glu Ser Thr Val Thr Ser Thr Asn Glu Asn
 130 135 140

Lys Ser Tyr Lys Glu Asp Val Ile Ser Asp Arg Ile Ile Lys Lys Glu
 145 150 155 160

Phe Glu Asp Thr Ala Leu Ser Val Lys Asp Tyr Gly Ala Val Gly Asp
 165 170 175

Gly Ile His Asp Asp Arg Gln Ala Ile Gln Asp Ala Ile Asp Ala Ala
 180 185 190

Ala Gln Gly Leu Gly Gly Gly Asn Val Tyr Phe Pro Glu Gly Thr Tyr
 195 200 205

Leu Val Lys Glu Ile Val Phe Leu Lys Ser His Thr His Leu Glu Leu
 210 215 220

Asn Glu Lys Ala Thr Ile Leu Asn Gly Ile Asn Ile Lys Asn His Pro
 225 230 235 240

Ser Ile Val Phe Met Thr Gly Leu Phe Thr Asp Asp Gly Ala Gln Val
 245 250 255

Glu Trp Gly Pro Thr Glu Asp Ile Ser Tyr Ser Gly Gly Thr Ile Asp
 260 265 270

Met Asn Gly Ala Leu Asn Glu Glu Gly Thr Lys Ala Lys Asn Leu Pro
 275 280 285

Leu Ile Asn Ser Ser Gly Ala Phe Ala Ile Gly Asn Ser Asn Asn Val
 290 295 300

Thr Ile Lys Asn Val Thr Phe Lys Asp Ser Tyr Gln Gly His Ala Ile
 305 310 315 320

Gln Ile Ala Gly Ser Lys Asn Val Leu Val Asp Asn Ser Arg Phe Leu
 325 330 335

Gly Gln Ala Leu Pro Lys Thr Met Lys Asp Gly Gln Ile Ile Ser Lys
 340 345 350

Glu Ser Ile Gln Ile Glu Pro Leu Thr Arg Lys Gly Phe Pro Tyr Ala
 355 360 365

Leu Asn Asp Asp Gly Lys Lys Ser Glu Asn Val Thr Ile Gln Asn Ser
 370 375 380

Tyr Phe Gly Lys Ser Asp Lys Ser Gly Glu Leu Val Thr Ala Ile Gly
 385 390 395 400

Thr His Tyr Gln Thr Leu Ser Thr Gln Asn Pro Ser Asn Ile Lys Ile
 405 410 415

Gln Asn Asn His Phe Asp Asn Met Met Tyr Ala Gly Val Arg Phe Thr
 420 425 430

Gly Phe Thr Asp Val Leu Ile Lys Gly Asn Arg Phe Asp Lys Lys Val
 435 440 445

Lys Gly Glu Ser Val His Tyr Arg Glu Ser Gly Ala Ala Leu Val Asn
 450 455 460

Ala Tyr Ser Tyr Lys Asn Thr Lys Asp Leu Leu Asp Leu Asn Lys Gln
 465 470 475 480

Val Val Ile Ala Glu Asn Ile Phe Asn Ile Ala Asp Pro Lys Thr Lys
 485 490 495

Ala Ile Arg Val Ala Lys Asp Ser Ala Glu Cys Leu Gly Lys Val Ser
 500 505 510

Asp Ile Thr Val Thr Lys Asn Val Ile Asn Asn Asn Ser Lys Glu Thr
 515 520 525

Glu Gln Pro Asn Ile Glu Leu Leu Arg Val Ser Asp Asn Leu Val Val
 530 535 540

Ser Glu Asn Ser

545

<210> 83

<211> 324

<212> DNA

<213> Streptococcus pneumoniae

<400> 83

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gtgatgaaag aaactcagct attaaaaggt gttcttgaag gttgtgtcctt ggatatgatt 60
ggtcaaaaag agcggatatgg ttatgagttg gttcagactt tgcgagaggc tggatttgat 120
actatcgttc caggaactat ttatcctttg ttgcaaaagt tagaaaaaaa tcaatggata 180
agaggcgaca tgcgcccgtc gccagatggg ccagatcgga agtatttttc attaatgaaa 240
gaaggagaag agcgtgtctc agtcttttgg caacaatggg acgatttgag tcaaaaagta 300
gaagggatta agaatggggg ttaa                                     324
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<210> 84

<211> 107

<212> PRT

<213> Streptococcus pneumoniae

<400> 84

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Met Met Lys Glu Thr Gln Leu Leu Lys Gly Val Leu Glu Gly Cys Val
  1              5              10             15
```

```
Leu Asp Met Ile Gly Gln Lys Glu Arg Tyr Gly Tyr Glu Leu Val Gln
      20              25             30
```

```
Thr Leu Arg Glu Ala Gly Phe Asp Thr Ile Val Pro Gly Thr Ile Tyr
    35              40             45
```

```
Pro Leu Leu Gln Lys Leu Glu Lys Asn Gln Trp Ile Arg Gly Asp Met
    50              55             60
```

Arg Pro Ser Pro Asp Gly Pro Asp Arg Lys Tyr Phe Ser Leu Met Lys
65 70 75 80

Glu Gly Glu Glu Arg Val Ser Val Phe Trp Gln Gln Trp Asp Asp Leu
85 90 95

Ser Gln Lys Val Glu Gly Ile Lys Asn Gly Gly
100 105

<210> 85

<211> 816

<212> DNA

<213> Streptococcus pneumoniae

<400> 85

atgaagaaaa tgaagtatta cgaagaaaca agcgctttgc tacatgagtt ttctgaggag 60
aatcaaaagt attttgagga gttgtgggaa agttttaatc ttgctggatt tctctatgat 120
gaagactatc tcagagagca gatctatttg atgatgctag atttctcaga agcagaacga 180
gatggcatga gtgcagagga ttatctaggt aagaatccta aaaaaataat gaaagagatt 240
ctcaaggagg cacctcgag ttctatcaaa gagtcccttt tgacgccaat tcttgtcctg 300
gcggtattac gttattatca actactaagt gatttttcta aaggtcctct cttaacagtc 360
aatttgetca catttttagg gcaacttctt atttttctga ttggatttgg acttgtggcc 420
acaattttac gaagaagttt agtccaagat tctcctaaaa tgaaaattgg cacttacatt 480
gttgttggga ctatagttct tctagttggt ttaggatatg taggaatggc aagcttcata 540
caagaaggag ctttttatat tccggctccc tgggatagtt tgtctgtctt tacgatttcg 600
ctagttatcg gtatttggaa ttggaaagaa gcggtctttc gtccatttgt cagtatgatt 660
attgcccac tttgtggtggg ttctctgctc cgttattatg agtggatggg aatttcaa 720
gttttcctta caaaagttat tccttttagct gtcctcttta ttggaatctt tgtcttggtc 780
cgtgggttta agaagataaa atggagtga gtatag 816

<210> 86

<211> 271

<212> PRT

<213> Streptococcus pneumoniae

<400> 86

Met Lys Lys Met Lys Tyr Tyr Glu Glu Thr Ser Ala Leu Leu His Glu
 1 5 10 15

Phe Ser Glu Glu Asn Gln Lys Tyr Phe Glu Glu Leu Trp Glu Ser Phe
 20 25 30

Asn Leu Ala Gly Phe Leu Tyr Asp Glu Asp Tyr Leu Arg Glu Gln Ile
 35 40 45

Tyr Leu Met Met Leu Asp Phe Ser Glu Ala Glu Arg Asp Gly Met Ser
 50 55 60

Ala Glu Asp Tyr Leu Gly Lys Asn Pro Lys Lys Ile Met Lys Glu Ile
 65 70 75 80

Leu Lys Gly Ala Pro Arg Ser Ser Ile Lys Glu Ser Leu Leu Thr Pro
 85 90 95

Ile Leu Val Leu Ala Val Leu Arg Tyr Tyr Gln Leu Leu Ser Asp Phe
 100 105 110

Ser Lys Gly Pro Leu Leu Thr Val Asn Leu Leu Thr Phe Leu Gly Gln
 115 120 125

Leu Leu Ile Phe Leu Ile Gly Phe Gly Leu Val Ala Thr Ile Leu Arg
 130 135 140

Arg Ser Leu Val Gln Asp Ser Pro Lys Met Lys Ile Gly Thr Tyr Ile
 145 150 155 160

Val Val Gly Thr Ile Val Leu Leu Val Val Leu Gly Tyr Val Gly Met
 165 170 175

Ala Ser Phe Ile Gln Glu Gly Ala Phe Tyr Ile Pro Ala Pro Trp Asp
 180 185 190

Ser Leu Ser Val Phe Thr Ile Ser Leu Val Ile Gly Ile Trp Asn Trp
 195 200 205

Lys Glu Ala Val Phe Arg Pro Phe Val Ser Met Ile Ile Ala His Leu
 210 215 220

Val Val Gly Ser Leu Leu Arg Tyr Tyr Glu Trp Met Gly Ile Ser Asn
 225 230 235 240

Val Phe Leu Thr Lys Val Ile Pro Leu Ala Val Leu Phe Ile Gly Ile
 245 250 255

Phe Val Leu Phe Arg Gly Phe Lys Lys Ile Lys Trp Ser Glu Val
 260 265 270

<210> 87

<211> 348

<212> DNA

<213> Streptococcus pneumoniae

<400> 87

ctgttttttt atttatactc aatgaaaatc aaagagcaaa ctaggaagct agccgcaggt 60
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 tttgagggtg tagatgaaac tgacgaagtc agctcaaaac actgttttga gggtgtagat 180
 gaaactgacg aagtcagctc aaaacactgt tttgagggtg tagatgaaac tgacgaagtc 240
 agctcaaaac atgtttttga gggtgtagat gaaactgacg aagtcagtaa ccatacatc 300
 ggtagggcga cgctgacgtg gtttgaagag attttcgaag agtatttaa 348

<210> 88

<211> 115

<212> PRT

<213> Streptococcus pneumoniae

<400> 88

Met Phe Phe Tyr Leu Tyr Ser Met Lys Ile Lys Glu Gln Thr Arg Lys

1

5

10

15

Leu Ala Ala Gly Cys Ser Lys His Cys Phe Glu Val Val Asp Glu Thr
 20 25 30

Asp Glu Val Ser Ser Lys His Val Phe Glu Val Val Asp Glu Thr Asp
 35 40 45

Glu Val Ser Ser Lys His Cys Phe Glu Val Val Asp Glu Thr Asp Glu
 50 55 60

Val Ser Ser Lys His Cys Phe Glu Val Val Asp Glu Thr Asp Glu Val
 65 70 75 80

Ser Ser Lys His Val Phe Glu Val Val Asp Glu Thr Asp Glu Val Ser
 85 90 95

Asn His Thr Tyr Gly Arg Ala Thr Leu Thr Trp Phe Glu Glu Ile Phe
 100 105 110

Glu Glu Tyr
 115

<210> 89

<211> 1260

<212> DNA

<213> Streptococcus pneumoniae

<400> 89

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 actatgattg ggattattat cgggtgttca tcagttgttg tgattatggc tttgggtgat 120
 tccctatctc gtcaagtcaa taaagatatg actaaatctc agaaaaatat tagcgtcttt 180
 ttctctccta aaaaaagtaa agacgggtct tttactcaga aacaatcagc ttttacgggt 240
 tctggaaagg aagaggaagt tcctgttgaa ccgccaaaac cgcaagaatc ctgggtccaa 300
 gaggcagcta aactgaaggg agtggatagt tactatgtaa ccaattcaac gaatgccatc 360
 ttgacctatc aagataaaaa ggttgagaat gctaatttga caggtggaaa cagaacttac 420
 atggacgctg ttaagaatga aattattgca ggtcgtagtc tgagagagca agatttcaaa 480
 gagtttgcaa gtgtcatttt gctagatgag gaattgtcca ttagtttatt tgaatctcct 540

caagaggcta ttaacaaggt tgtagaagtc aatggattta gttaccgggt cattgggggt 600
 tatactagtc cggaggctaa aagatcaaaa atatatgggt ttggtggctt gcctattact 660
 accaatatct cccttgctgc gaattttaat gtagatgaaa tagctaatat tgtctttcga 720
 gtgaatgata ccagtttaac cccaactctg ggtccagaac tggcacgaaa aatgacagag 780
 cttgcaggct tacaacaggg agaataccag gtggcagatg agtccgttgt atttgcagaa 840
 attcaacaat cgttttagttt tatgacgacg attattagtt ccatcgcagg gatttctctc 900
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<210> 90

<211> 419

<212> PRT

<213> Streptococcus pneumoniae

<400> 90

Met	Gln	Asn	Leu	Lys	Phe	Ala	Phe	Ser	Ser	Ile	Met	Ala	His	Lys	Met
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Arg	Ser	Leu	Leu	Thr	Met	Ile	Gly	Ile	Ile	Ile	Gly	Val	Ser	Ser	Val
			20					25						30	

Val	Val	Ile	Met	Ala	Leu	Gly	Asp	Ser	Leu	Ser	Arg	Gln	Val	Asn	Lys
			35					40					45		

Asp	Met	Thr	Lys	Ser	Gln	Lys	Asn	Ile	Ser	Val	Phe	Phe	Ser	Pro	Lys
		50				55					60				

Lys	Ser	Lys	Asp	Gly	Ser	Phe	Thr	Gln	Lys	Gln	Ser	Ala	Phe	Thr	Val
65					70				75					80	

Ser	Gly	Lys	Glu	Glu	Glu	Val	Pro	Val	Glu	Pro	Pro	Lys	Pro	Gln	Glu
					85				90					95	

120

Ser Trp Val Gln Glu Ala Ala Lys Leu Lys Gly Val Asp Ser Tyr Tyr
100 105 110

Val Thr Asn Ser Thr Asn Ala Ile Leu Thr Tyr Gln Asp Lys Lys Val
115 120 125

Glu Asn Ala Asn Leu Thr Gly Gly Asn Arg Thr Tyr Met Asp Ala Val
130 135 140

Lys Asn Glu Ile Ile Ala Gly Arg Ser Leu Arg Glu Gln Asp Phe Lys
145 150 155 160

Glu Phe Ala Ser Val Ile Leu Leu Asp Gly Glu Leu Ser Ile Ser Leu
165 170 175

Phe Glu Ser Pro Gln Glu Ala Ile Asn Lys Val Val Glu Val Asn Gly
180 185 190

Phe Ser Tyr Arg Val Ile Gly Val Tyr Thr Ser Pro Glu Ala Lys Arg
195 200 205

Ser Lys Ile Tyr Gly Phe Gly Gly Leu Pro Ile Thr Thr Asn Ile Ser
210 215 220

Leu Ala Ala Asn Phe Asn Val Asp Glu Ile Ala Asn Ile Val Phe Arg
225 230 235 240

Val Asn Asp Thr Ser Leu Thr Pro Thr Leu Gly Pro Glu Leu Ala Arg
245 250 255

Lys Met Thr Glu Leu Ala Gly Leu Gln Gln Gly Glu Tyr Gln Val Ala
260 265 270

Asp Glu Ser Val Val Phe Ala Glu Ile Gln Gln Ser Phe Ser Phe Met
275 280 285

Thr Thr Ile Ile Ser Ser Ile Ala Gly Ile Ser Leu Phe Val Gly Gly
290 295 300

Thr Gly Val Met Asn Ile Met Leu Val Ser Val Thr Glu Arg Thr Arg
305 310 315 320

Glu Ile Gly Leu Arg Lys Ala Leu Gly Ala Thr Arg Ala Asn Ile Leu
325 330 335

Ile Gln Phe Leu Ile Glu Ser Met Ile Leu Thr Leu Leu Gly Gly Leu
340 345 350

Ile Gly Leu Thr Ile Ala Ser Gly Leu Thr Ala Leu Ala Gly Leu Leu
355 360 365

Leu Gln Gly Leu Ile Glu Gly Ile Glu Val Gly Val Ser Ile Pro Val
370 375 380

Ala Leu Phe Ser Leu Ala Val Ser Ala Ser Val Gly Met Ile Phe Gly
385 390 395 400

Val Leu Pro Ala Asn Lys Ala Ser Lys Leu Asp Pro Ile Glu Ala Leu
405 410 415

Arg Tyr Glu

<210> 91

<211> 705

<212> DNA

<213> Streptococcus pneumoniae

<400> 91

ctgatgaagc aactaattag tctaaaaaat atcttcagaa gttaccgtaa tggtagaccaa 60
gaactgcagg ttctcaaaaa tatcaatcta gaagtgaatg aggggtgaatt tntagccatc 120
atgggaccat ctgggtctgg taagtccact ctgatgaata cgattggcat gttggataca 180
ccaaccagtg gagaatatta tcttgaaggt caagaagtgg ctgggcttgg tgaaaaacaa 240
ctagctaagg tccgtaacca acaaatcggg tttgtctttc agcagttcct tcttctatcg 300
aagctcaatg ctctgcaaaa tgtagaattg cccttgattt acgcaggagt ttcgtcttca 360

aaacgtcgca agttggctga ggaatattta gacaagggtg aattgacaga acgtagtcac 420
 catttacctt cagaattatc tgggtggctcaa aagcaacgtg tagccattgc gcgtgccttg 480
 gtaaacaatc cttctattat cctagcggat gaaccgacag gagccttgga taccaaaaaca 540
 ggtaacacaaa ttatgcaatt attggttgat ttgaataaaag aaggaaaaaac cattatcatg 600
 gtaacgcatg agcctgagat tgctgcctat gccaaacgtc agattgtcat tcgggatggg 660
 gtcatttcgt ctgacagtgc tcagttagga aaggaggaaa actaa 705

<210> 92

<211> 234

<212> PRT

<213> Streptococcus pneumoniae

<400> 92

Met Met Lys Gln Leu Ile Ser Leu Lys Asn Ile Phe Arg Ser Tyr Arg
 1 5 10 15

Asn Gly Asp Gln Glu Leu Gln Val Leu Lys Asn Ile Asn Leu Glu Val
 20 25 30

Asn Glu Gly Glu Phe Val Ala Ile Met Gly Pro Ser Gly Ser Gly Lys
 35 40 45

Ser Thr Leu Met Asn Thr Ile Gly Met Leu Asp Thr Pro Thr Ser Gly
 50 55 60

Glu Tyr Tyr Leu Glu Gly Gln Glu Val Ala Gly Leu Gly Glu Lys Gln
 65 70 75 80

Leu Ala Lys Val Arg Asn Gln Gln Ile Gly Phe Val Phe Gln Gln Phe
 85 90 95

Phe Leu Leu Ser Lys Leu Asn Ala Leu Gln Asn Val Glu Leu Pro Leu
 100 105 110

Ile Tyr Ala Gly Val Ser Ser Ser Lys Arg Arg Lys Leu Ala Glu Glu
 115 120 125

Tyr Leu Asp Lys Val Glu Leu Thr Glu Arg Ser His His Leu Pro Ser
 130 135 140

Glu Leu Ser Gly Gly Gln Lys Gln Arg Val Ala Ile Ala Arg Ala Leu
 145 150 155 160

Val Asn Asn Pro Ser Ile Ile Leu Ala Asp Glu Pro Thr Gly Ala Leu
 165 170 175

Asp Thr Lys Thr Gly Asn Gln Ile Met Gln Leu Leu Val Asp Leu Asn
 180 185 190

Lys Glu Gly Lys Thr Ile Ile Met Val Thr His Glu Pro Glu Ile Ala
 195 200 205

Ala Tyr Ala Lys Arg Gln Ile Val Ile Arg Asp Gly Val Ile Ser Ser
 210 215 220

Asp Ser Ala Gln Leu Gly Lys Glu Glu Asn
 225 230

<210> 93

<211> 1200

<212> DNA

<213> Streptococcus pneumoniae

<400> 93

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 ctaaaagatg agcctactca tcttggttgtt gccaaaggaag gaagcgtggc ctctctgtgt 180
 ttattgtcag ggacagtaac agcaaaaaat gaacaatatg tttattttga tgctagtaag 240
 ggtgatttag atgaaatcct tgtttctgtg ggcgataagg tcagcgaagg gcaggcttta 300
 gtcaagtaca gtagttcaga agcgcaggcg gcctatgatt cagctagtcg agcagtagct 360
 agggcagatc gtcatatcaa tgaactcaat caagcacgaa atgaagccgc ttcagctccg 420
 gctccacagt taccagcgcc agtaggagga gaagatgcaa cggtgcaaag cccaactcca 480
 gtggctggaa attctgttgc ttctattgac gctcaattgg gtgatgcccg tgatgcgcgt 540

gcagatgctg cggcgcaatt aagcaaggct caaagtcaat tggatgcaac aactgttctc 600
 agtaccctag aggggaactgt ggtcgaagtc aatagcaatg tttctaaatc tccaacaggg 660
 gcgagtcaag ttatggttca tattgtcagc aatgaaaatt tacaagtcaa gggagaattg 720
 tctgagtaca atctagccaa cttttctgta ggtcaagaag taagctttac ttctaaagtg 780
 tctcctgata aaaaatggac tgggaaatta agctatattt ctgactatcc taaaaacaat 840
 ggtgaagcag ctagtccagc agccgggaat aatacaggtt ctaaataccc ttatactatt 900
 gatgtgacag gcgagggttg tgatttgaaa caagggtttt ctgtcaacat tgagggttaa 960
 agcaaaaacta aggctattct tgttcctgtt agcagtctag taatggatga tagtaaaaaat 1020
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 gctgacgcag aaaatcaaga aatcacttct ggtttaacga acggtgctaa ggtcatcagt 1140
 aatccaacat cttccttgga agaaggaaaa gaggtgaagg ctgatgaagc aactaattag 1200

<210> 94

<211> 399

<212> PRT

<213> Streptococcus pneumoniae

<400> 94

Met	Lys	Lys	Lys	Asn	Gly	Lys	Ala	Lys	Lys	Trp	Gln	Leu	Tyr	Ala	Ala
1				5				10				15			

Ile	Gly	Ala	Ala	Ser	Val	Val	Val	Leu	Gly	Ala	Gly	Gly	Ile	Leu	Leu
				20				25					30		

Phe	Arg	Gln	Pro	Ser	Gln	Thr	Ala	Leu	Lys	Asp	Glu	Pro	Thr	His	Leu
				35				40					45		

Val	Val	Ala	Lys	Glu	Gly	Ser	Val	Ala	Ser	Ser	Val	Leu	Leu	Ser	Gly
				50				55				60			

Thr	Val	Thr	Ala	Lys	Asn	Glu	Gln	Tyr	Val	Tyr	Phe	Asp	Ala	Ser	Lys
				65				70				75			80

Gly	Asp	Leu	Asp	Glu	Ile	Leu	Val	Ser	Val	Gly	Asp	Lys	Val	Ser	Glu
								85				90			95

125

Gly Gln Ala Leu Val Lys Tyr Ser Ser Ser Glu Ala Gln Ala Ala Tyr
100 105 110

Asp Ser Ala Ser Arg Ala Val Ala Arg Ala Asp Arg His Ile Asn Glu
115 120 125

Leu Asn Gln Ala Arg Asn Glu Ala Ala Ser Ala Pro Ala Pro Gln Leu
130 135 140

Pro Ala Pro Val Gly Gly Glu Asp Ala Thr Val Gln Ser Pro Thr Pro
145 150 155 160

Val Ala Gly Asn Ser Val Ala Ser Ile Asp Ala Gln Leu Gly Asp Ala
165 170 175

Arg Asp Ala Arg Ala Asp Ala Ala Ala Gln Leu Ser Lys Ala Gln Ser
180 185 190

Gln Leu Asp Ala Thr Thr Val Leu Ser Thr Leu Glu Gly Thr Val Val
195 200 205

Glu Val Asn Ser Asn Val Ser Lys Ser Pro Thr Gly Ala Ser Gln Val
210 215 220

Met Val His Ile Val Ser Asn Glu Asn Leu Gln Val Lys Gly Glu Leu
225 230 235 240

Ser Glu Tyr Asn Leu Ala Asn Leu Ser Val Gly Gln Glu Val Ser Phe
245 250 255

Thr Ser Lys Val Tyr Pro Asp Lys Lys Trp Thr Gly Lys Leu Ser Tyr
260 265 270

Ile Ser Asp Tyr Pro Lys Asn Asn Gly Glu Ala Ala Ser Pro Ala Ala
275 280 285

Gly Asn Asn Thr Gly Ser Lys Tyr Pro Tyr Thr Ile Asp Val Thr Gly
290 295 300

Glu Val Gly Asp Leu Lys Gln Gly Phe Ser Val Asn Ile Glu Val Lys
 305 310 315 320

Ser Lys Thr Lys Ala Ile Leu Val Pro Val Ser Ser Leu Val Met Asp
 325 330 335

Asp Ser Lys Asn Tyr Val Trp Ile Val Asp Glu Gln Gln Lys Ala Lys
 340 345 350

Lys Val Glu Val Ser Leu Gly Asn Ala Asp Ala Glu Asn Gln Glu Ile
 355 360 365

Thr Ser Gly Leu Thr Asn Gly Ala Lys Val Ile Ser Asn Pro Thr Ser
 370 375 380

Ser Leu Glu Glu Gly Lys Glu Val Lys Ala Asp Glu Ala Thr Asn
 385 390 395

<210> 95

<211> 759

<212> DNA

<213> Streptococcus pneumoniae

<400> 95

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759

<210> 96

<211> 252

<212> PRT

<213> Streptococcus pneumoniae

<400> 96

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Ser Ser Asp Leu Val Glu Ala Gly Ile Ala Ala Pro Ala Leu Asp Leu
 35 40 45

Thr Thr Val Leu Ala Val Ala Lys Gly Ser Asn Leu Lys Val Ala Ala
 50 55 60

Gln Asn Cys Tyr Phe Glu Asn Ala Gly Ala Phe Thr Gly Glu Thr Ser
 65 70 75 80

Pro Gln Val Leu Lys Glu Ile Gly Thr Asp Tyr Val Val Ile Gly His
 85 90 95

Ser Glu Arg Arg Asp Tyr Phe His Glu Thr Asp Glu Asp Ile Asn Lys
 100 105 110

Lys Ala Lys Ala Ile Phe Ala Asn Gly Met Leu Pro Ile Ile Cys Cys
 115 120 125

Gly Glu Ser Leu Glu Thr Tyr Glu Ala Gly Lys Ala Ala Glu Phe Val
 130 135 140

Gly Ala Gln Val Ser Ala Ala Leu Ala Gly Leu Thr Ala Glu Gln Val
 145 150 155 160

Ala Ala Ser Val Ile Ala Tyr Glu Pro Ile Trp Ala Ile Gly Thr Gly
 165 170 175

Lys Ser Ala Ser Gln Asp Asp Ala Gln Lys Met Cys Lys Val Val Arg
 180 185 190

Asp Val Val Ala Ala Asp Phe Gly Gln Glu Val Ala Asp Lys Val Arg
 195 200 205

Val Gln Tyr Gly Gly Ser Val Lys Pro Glu Asn Val Ala Ser Tyr Met
 210 215 220

Ala Cys Pro Asp Val Asp Gly Ala Leu Val Gly Gly Ala Ser Leu Glu
 225 230 235 240

Ala Glu Ser Phe Leu Ala Leu Leu Asp Phe Val Lys
 245 250

<210> 97

<211> 1473

<212> DNA

<213> Streptococcus pneumoniae

<400> 97

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<210> 98

<211> 490

<212> PRT

<213> Streptococcus pneumoniae

<400> 98

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 35 40 45

Lys Thr Gln Thr Ser Ala Glu Val Gln Thr Asn Ala Ala Ala His Trp
 50 55 60

Asp Gly Asp Tyr Tyr Val Lys Asp Asp Gly Ser Lys Ala Gln Ser Glu
 65 70 75 80

Trp Ile Phe Asp Asn Tyr Tyr Lys Ala Trp Phe Tyr Ile Asn Ser Asp
 85 90 95

130

Gly Arg Tyr Ser Gln Asn Glu Trp His Gly Asn Tyr Tyr Leu Lys Ser
100 105 110

Gly Gly Tyr Met Ala Gln Asn Glu Trp Ile Tyr Asp Ser Asn Tyr Lys
115 120 125

Ser Trp Phe Tyr Leu Lys Ser Asp Gly Ala Tyr Ala His Gln Glu Trp
130 135 140

Gln Leu Ile Gly Asn Lys Trp Tyr Tyr Phe Lys Lys Trp Gly Tyr Met
145 150 155 160

Ala Lys Ser Gln Trp Gln Gly Ser Tyr Phe Leu Asn Gly Gln Gly Ala
165 170 175

Met Met Gln Asn Glu Trp Leu Tyr Asp Pro Ala Tyr Ser Ala Tyr Phe
180 185 190

Tyr Leu Lys Ser Asp Gly Thr Tyr Ala Asn Gln Glu Trp Gln Lys Val
195 200 205

Gly Gly Lys Trp Tyr Tyr Phe Lys Lys Trp Gly Tyr Met Ala Arg Asn
210 215 220

Glu Trp Gln Gly Asn Tyr Tyr Leu Thr Gly Ser Gly Ala Met Ala Thr
225 230 235 240

Asp Glu Val Ile Met Asp Gly Thr Arg Tyr Ile Phe Ala Ala Ser Gly
245 250 255

Glu Leu Lys Glu Lys Lys Asp Leu Asn Val Gly Trp Val His Arg Asp
260 265 270

Gly Lys Arg Tyr Phe Phe Asn Asn Arg Glu Glu Gln Val Gly Thr Glu
275 280 285

His Ala Lys Lys Val Ile Asp Ile Ser Glu His Asn Gly Arg Ile Asn
290 295 300

Asp Trp Lys Lys Val Ile Asp Glu Asn Glu Val Asp Gly Val Ile Val
 305 310 315 320

Arg Leu Gly Tyr Ser Gly Lys Glu Asp Lys Glu Leu Ala His Asn Ile
 325 330 335

Lys Glu Leu Asn Arg Leu Gly Ile Pro Tyr Gly Val Tyr Leu Tyr Thr
 340 345 350

Tyr Ala Glu Asn Glu Thr Asp Ala Glu Ser Asp Ala Lys Gln Thr Ile
 355 360 365

Glu Leu Ile Lys Lys Tyr Asn Met Asn Leu Ser Tyr Pro Ile Tyr Tyr
 370 375 380

Asp Val Glu Asn Trp Glu Tyr Val Asn Lys Ser Lys Arg Ala Pro Ser
 385 390 395 400

Asp Thr Gly Thr Trp Val Lys Ile Ile Asn Lys Tyr Met Asp Thr Met
 405 410 415

Lys Gln Ala Gly Tyr Gln Asn Val Tyr Val Tyr Ser Tyr Arg Ser Leu
 420 425 430

Leu Gln Thr Arg Leu Lys His Pro Asp Ile Leu Lys His Val Asn Trp
 435 440 445

Val Ala Ala Tyr Thr Asn Ala Leu Glu Trp Glu Asn Pro His Tyr Ser
 450 455 460

Gly Lys Lys Gly Trp Gln Tyr Thr Ser Ser Glu Tyr Met Lys Gly Ile
 465 470 475 480

Gln Gly Arg Val Asp Val Ser Val Trp Tyr
 485 490

<210> 99

<211> 774

<212> DNA

<213> Streptococcus pneumoniae

<400> 99

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<210> 100

<211> 257

<212> PRT

<213> Streptococcus pneumoniae

<400> 100

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Asp Met Asn Ser Phe Thr Gly Phe Ser Trp Thr His Phe Glu Thr Met
 35 40 45

Phe Gly Asp Gly Arg Leu Met Leu Ile Leu Ala Gln Thr Phe Phe Leu
 50 55 60

Ala Phe Leu Ser Ala Leu Ile Ala Thr Ile Ile Gly Thr Phe Gly Ala
65 70 75 80

Ile Tyr Ile Tyr Gln Ser Arg Lys Lys Tyr Gln Glu Ala Phe Leu Ser
85 90 95

Leu Asn Asn Ile Leu Met Val Ala Pro Asp Val Met Ile Gly Ala Ser
100 105 110

Phe Leu Ile Leu Phe Thr Gln Leu Lys Phe Ser Leu Gly Phe Leu Thr
115 120 125

Val Leu Ser Ser His Val Ala Phe Ser Ile Pro Ile Val Val Leu Met
130 135 140

Val Leu Pro Arg Leu Lys Glu Met Asn Gly Asp Met Ile His Ala Ala
145 150 155 160

Tyr Asp Leu Gly Ala Ser Gln Phe Gln Met Phe Lys Glu Ile Met Leu
165 170 175

Pro Tyr Leu Thr Pro Ser Ile Ile Thr Gly Tyr Phe Met Ala Phe Thr
180 185 190

Tyr Ser Leu Asp Asp Phe Ala Val Thr Phe Phe Val Thr Gly Asn Gly
195 200 205

Phe Ser Thr Leu Ser Val Glu Ile Tyr Ser Arg Ala Arg Lys Gly Ile
210 215 220

Ser Leu Glu Ile Asn Ala Leu Ser Ala Leu Val Phe Leu Phe Ser Ile
225 230 235 240

Ile Leu Val Val Gly Tyr Tyr Phe Ile Ser Arg Glu Lys Glu Glu Gln
245 250 255

Ala

<210> 101

<211> 1071

<212> DNA

<213> Streptococcus pneumoniae

<400> 101

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<210> 102

<211> 356

<212> PRT

<213> Streptococcus pneumoniae

<400> 102

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15

135

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20 25 30

Asp Ser Gln Lys Leu Val Ile Tyr Asn Trp Gly Asp Tyr Ile Asp Pro
35 40 45

Glu Leu Leu Thr Gln Phe Thr Glu Glu Thr Gly Ile Gln Val Gln Tyr
50 55 60

Glu Thr Phe Asp Ser Asn Glu Ala Met Tyr Thr Lys Ile Lys Gln Gly
65 70 75 80

Gly Thr Thr Tyr Asp Ile Ala Ile Pro Ser Glu Tyr Met Ile Asn Lys
85 90 95

Met Lys Asp Glu Asp Leu Leu Val Pro Leu Asp Tyr Ser Lys Ile Glu
100 105 110

Gly Ile Glu Asn Ile Gly Pro Glu Phe Leu Asn Gln Ser Phe Asp Pro
115 120 125

Gly Asn Lys Phe Ser Ile Pro Tyr Phe Trp Gly Thr Leu Gly Ile Val
130 135 140

Tyr Asn Glu Thr Met Val Asp Glu Ala Pro Glu His Trp Asp Asp Leu
145 150 155 160

Trp Lys Pro Glu Tyr Lys Asn Ser Ile Met Leu Phe Asp Gly Ala Arg
165 170 175

Glu Val Leu Gly Leu Gly Leu Asn Ser Leu Gly Tyr Ser Leu Asn Ser
180 185 190

Lys Asp Leu Gln Gln Leu Glu Glu Thr Val Asp Lys Leu Tyr Lys Leu
195 200 205

Thr Pro Asn Ile Lys Ala Ile Val Ala Asp Glu Met Lys Gly Tyr Met
210 215 220

136

Ile Gln Asn Asn Val Ala Ile Gly Val Thr Phe Ser Gly Glu Ala Ser
225 230 235 240

Gln Met Leu Glu Lys Asn Glu Asn Leu Arg Tyr Val Val Pro Thr Glu
245 250 255

Ala Ser Asn Leu Trp Phe Asp Asn Met Val Ile Pro Lys Thr Val Lys
260 265 270

Asn Gln Asn Ser Ala Tyr Ala Phe Ile Asn Phe Met Leu Lys Pro Glu
275 280 285

Asn Ala Leu Gln Asn Ala Glu Tyr Val Gly Tyr Ser Thr Pro Asn Leu
290 295 300

Pro Ala Lys Glu Leu Leu Pro Glu Glu Thr Lys Glu Asp Lys Ala Phe
305 310 315 320

Tyr Pro Asp Val Glu Thr Met Lys His Leu Glu Val Tyr Glu Lys Phe
325 330 335

Asp His Lys Trp Thr Gly Lys Tyr Ser Asp Leu Phe Leu Gln Phe Lys
340 345 350

Met Tyr Arg Lys
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<210> 103

<211> 1851

<212> DNA

<213> Streptococcus pneumoniae

<400> 103

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<210> 104

<211> 616

<212> PRT

<213> Streptococcus pneumoniae

<400> 104

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1

5

10

15

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Met Val Val Ser Ile Ile Val Ser Tyr Ile Leu Phe Tyr Gly Leu Ile
35 40 45

Asn Pro Ala Pro Val Asp Tyr Ile Ile Tyr Thr Ser Leu Ala Phe Leu
50 55 60

Phe Tyr Gln Leu Met Ile Gly Phe Trp Gly Leu Asn Ala Ser Ile Ser
65 70 75 80

Arg Tyr Ser Lys Ile Thr Asp Phe Met Lys Ile Phe Phe Gly Val Thr
85 90 95

Ala Ser Ser Val Leu Ser Tyr Ser Ile Cys Tyr Ala Phe Leu Pro Leu
100 105 110

Phe Ser Ile Arg Phe Ile Ile Leu Phe Ile Leu Leu Ser Thr Phe Leu
115 120 125

Ile Leu Leu Pro Arg Ile Thr Trp Gln Leu Ile Tyr Ser Arg Arg Lys
130 135 140

Lys Gly Ser Gly Asp Gly Glu His Arg Arg Thr Phe Leu Ile Gly Ala
145 150 155 160

Gly Asp Gly Gly Ala Leu Phe Met Asp Ser Tyr Gln His Pro Thr Ser
165 170 175

Glu Leu Glu Leu Val Gly Ile Leu Asp Lys Asp Ser Lys Lys Lys Gly
180 185 190

Gln Lys Leu Gly Gly Ile Pro Val Leu Gly Ser Tyr Asp Asn Leu Pro
195 200 205

Glu Leu Ala Lys Arg His Gln Ile Glu Arg Val Ile Val Ala Ile Pro
210 215 220

Ser Leu Asp Pro Ser Glu Tyr Glu Arg Ile Leu Gln Met Cys Asn Lys
 225 230 235 240

Leu Gly Val Lys Cys Tyr Lys Met Pro Lys Val Glu Thr Val Val Gln
 245 250 255

Gly Leu His Gln Ala Gly Thr Gly Phe Gln Lys Ile Asp Ile Thr Asp
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Leu Leu Gly Arg Gln Glu Ile Arg Leu Asp Glu Ser Arg Leu Gly Ala
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Glu Leu Thr Gly Lys Thr Ile Leu Val Thr Gly Ala Gly Gly Ser Ile
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Gly Ser Glu Ile Cys Arg Gln Val Ser Arg Phe Asn Pro Glu Arg Ile
 305 310 315 320

Val Leu Leu Gly His Gly Glu Asn Ser Ile Tyr Leu Val Tyr His Glu
 325 330 335

Leu Ile Arg Lys Phe Gln Gly Ile Asp Tyr Val Pro Val Ile Ala Asp
 340 345 350

Ile Gln Asp Tyr Asp Arg Leu Leu Gln Val Phe Glu Gln Tyr Lys Pro
 355 360 365

Ala Ile Val Tyr His Ala Ala Ala His Lys His Val Pro Met Met Glu
 370 375 380

Arg Asn Pro Lys Glu Ala Phe Lys Asn Asn Ile Arg Gly Thr Tyr Asn
 385 390 395 400

Val Ala Lys Ala Val Asp Glu Ala Lys Val Ser Lys Met Val Met Ile
 405 410 415

Ser Thr Asp Lys Ala Val Asn Pro Pro Asn Val Met Gly Ala Thr Lys
 420 425 430

Arg Val Ala Glu Leu Ile Val Thr Gly Phe Asn Gln Arg Ser Gln Ser
 435 440 445

Thr Tyr Cys Ala Val Arg Phe Gly Asn Val Leu Gly Ser Arg Gly Ser
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Val Ile Pro Val Phe Glu Arg Gln Ile Ala Glu Gly Gly Pro Val Thr
 465 470 475 480

Val Thr Asp Phe Arg Met Thr Arg Tyr Phe Met Thr Ile Pro Glu Ala
 485 490 495

Ser Arg Leu Val Ile His Ala Gly Ala Tyr Ala Lys Asp Gly Glu Val
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Phe Ile Leu Asp Met Gly Lys Pro Val Lys Ile Tyr Asp Leu Ala Lys
 515 520 525

Lys Met Val Leu Leu Ser Gly His Thr Glu Ser Glu Ile Pro Ile Val
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Glu Val Gly Ile Arg Pro Gly Glu Lys Leu Tyr Glu Glu Leu Leu Val
 545 550 555 560

Ser Thr Glu Leu Val Asp Asn Gln Val Met Asp Lys Ile Phe Val Gly
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Phe Arg Thr Leu Ser Gly Asp Glu Leu Lys Gln Ala Ile Ile Ala Phe
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<210> 105

<211> 1338

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 105

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<210> 106

<211> 445

<212> PRT

<213> Streptococcus pneumoniae

<400> 106

Met Ile Glu Leu Tyr Asp Ser Tyr Ser Gln Glu Ser Arg Asp Leu His

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Glu Ser Leu Val Ala Thr Gly Leu Ser Gln Leu Gly Val Val Ile Asp

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Ala Asp Gly Phe Leu Pro Asp Gly Leu Leu Ser Pro Phe Thr Tyr Tyr

35 40 45

Leu Gly Tyr Glu Asp Gly Lys Pro Leu Tyr Phe Asn Gln Val Pro Val

50 55 60

Ser Asp Phe Trp Glu Ile Leu Gly Asp Asn Gln Ser Ala Cys Ile Glu

65 70 75 80

Asp Val Thr Gln Glu Arg Ala Val Ile His Tyr Ala Asp Gly Met Gln

85 90 95

Ala Arg Leu Val Lys Gln Val Asp Trp Lys Asp Leu Glu Gly Arg Val

100 105 110

Arg Gln Val Asp His Tyr Asn Arg Phe Gly Ala Cys Phe Ala Thr Thr

115 120 125

Thr Tyr Ser Ala Asp Ser Glu Pro Ile Met Thr Val Tyr Gln Asp Val

130 135 140

Asn Gly Gln Gln Val Leu Leu Glu Asn His Val Thr Gly Asp Ile Leu

145 150 155 160

Leu Thr Leu Pro Gly Gln Ser Met Arg Tyr Phe Ala Asn Lys Val Glu

165 170 175

Phe Ile Thr Phe Phe Leu Gln Asp Leu Glu Ile Asp Thr Ser Gln Leu
 180 185 190

Ile Phe Asn Thr Leu Ala Thr Pro Phe Leu Val Ser Phe His His Pro
 195 200 205

Asp Lys Ser Gly Ser Asp Val Leu Val Trp Gln Glu Pro Leu Tyr Asp
 210 215 220

Ala Ile Pro Gly Asn Met Gln Leu Ile Leu Glu Ser Asp Asn Val Arg
 225 230 235 240

Thr Lys Lys Ile Ile Ile Pro Asn Lys Ala Thr Tyr Glu Arg Ala Leu
 245 250 255

Glu Leu Thr Asp Glu Lys Tyr His Asp Gln Phe Val His Leu Gly Tyr
 260 265 270

His Tyr Gln Phe Lys Arg Asp Asn Phe Leu Arg Arg Asp Ala Leu Ile
 275 280 285

Leu Thr Asn Ser Asp Gln Ile Glu Gln Val Glu Ala Ile Ala Gly Ala
 290 295 300

Leu Pro Asp Val Thr Phe Arg Ile Ala Ala Val Thr Glu Met Ser Ser
 305 310 315 320

Lys Leu Leu Asp Met Leu Cys Tyr Pro Asn Val Ala Leu Tyr Gln Asn
 325 330 335

Ala Ser Pro Gln Lys Ile Gln Glu Leu Tyr Gln Leu Ser Asp Ile Tyr
 340 345 350

Leu Asp Ile Asn His Ser Asn Glu Leu Leu Gln Ala Val Arg Gln Ala
 355 360 365

Phe Glu His Asn Leu Leu Ile Leu Gly Phe Asn Gln Thr Val His Asn
 370 375 380

Arg Leu Tyr Ile Ala Pro Asp His Leu Phe Glu Ser Ser Glu Val Ala
385 390 395 400

Ala Leu Val Glu Thr Ile Lys Leu Ala Leu Ser Asp Val Asp Gln Met
405 410 415

Arg Gln Ala Leu Gly Lys Gln Gly Gln His Ala Asn Tyr Val Asp Leu
420 425 430

Val Arg Tyr Gln Glu Thr Met Gln Thr Val Leu Gly Gly
435 440 445

<210> 107

<211> 1512

<212> DNA

<213> Streptococcus pneumoniae

<400> 107

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<210> 108

<211> 503

<212> PRT

<213> Streptococcus pneumoniae

<400> 108

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Val Glu Tyr Ala Gln Ala Tyr Arg Ala Gly Val Phe Arg Lys Leu Asn
 20 25 30

Leu Ser Ser Lys Phe Ile Phe Thr Asp Met Ile Leu Ala Asp Asn Ile
 35 40 45

Gln His Leu Thr Ala Asn Ile Gly Phe Asp Asp Asn Gln Val Ile Trp
 50 55 60

Leu Tyr Asn His Phe Thr Asp Ile Lys Ile Ala Pro Thr Ser Val Thr
 65 70 75 80

Val Asp Asp Val Leu Ala Tyr Phe Gly Gly Glu Glu Ser His Arg Glu
 85 90 95

Lys Asn Gly Lys Val Leu Arg Val Phe Phe Phe Asp Gln Asp Lys Phe
 100 105 110

Val Thr Cys Tyr Leu Val Asp Glu Asn Lys Asp Leu Val Gln His Ala
 115 120 125

Glu Tyr Val Phe Lys Gly Asn Leu Ile Arg Lys Asp Tyr Phe Ser Tyr
 130 135 140

Thr Arg Tyr Cys Ser Glu Tyr Phe Ala Pro Lys Asp Asn Val Ala Val
 145 150 155 160

Leu Tyr Gln Arg Thr Phe Tyr Asn Glu Asp Gly Thr Pro Val Tyr Asp
 165 170 175

Ile Leu Met Asn Gln Gly Lys Glu Glu Val Tyr His Phe Lys Asp Lys
 180 185 190

Ile Phe Tyr Gly Lys Gln Ala Phe Val Arg Ala Phe Met Lys Ser Leu
 195 200 205

Asn Leu Asn Lys Ser Asp Leu Val Ile Leu Asp Arg Glu Thr Gly Ile
 210 215 220

Gly Gln Val Val Phe Glu Glu Ala Gln Thr Ala His Leu Ala Val Val
 225 230 235 240

Val His Ala Glu His Tyr Ser Glu Asn Ala Thr Asn Glu Asp Tyr Ile
 245 250 255

Leu Trp Asn Asn Tyr Tyr Asp Tyr Gln Phe Thr Asn Ala Asp Lys Val
 260 265 270

Asp Phe Phe Ile Val Ser Thr Asp Arg Gln Asn Glu Val Leu Gln Glu
 275 280 285

Gln Phe Ala Lys Tyr Thr Gln His Gln Pro Lys Ile Val Thr Ile Pro
 290 295 300

Val Gly Ser Ile Asp Ser Leu Thr Asp Ser Ser Gln Gly Arg Lys Pro
 305 310 315 320

Phe Ser Leu Ile Thr Ala Ser Arg Leu Ala Lys Glu Lys His Ile Asp
 325 330 335

Trp Leu Val Lys Ala Val Ile Glu Ala His Lys Glu Leu Pro Glu Leu
 340 345 350

Thr Phe Asp Ile Tyr Gly Ser Gly Gly Glu Asp Ser Leu Leu Arg Glu
 355 360 365

Ile Ile Ala Asn His Gln Ala Glu Asp Tyr Ile Gln Leu Lys Gly His
 370 375 380

Ala Glu Leu Ser Gln Ile Tyr Ser Gln Tyr Glu Val Tyr Leu Thr Ala
 385 390 395 400

Ser Thr Ser Glu Gly Phe Gly Leu Thr Leu Met Glu Ala Ile Gly Ser
 405 410 415

Gly Leu Pro Leu Ile Gly Phe Asp Val Pro Tyr Gly Asn Gln Thr Phe
 420 425 430

Ile Glu Asp Gly Gln Asn Gly Tyr Leu Ile Pro Ser Ser Ser Asp His
 435 440 445

Val Glu Asp Gln Ile Lys Gln Ala Tyr Ala Ala Lys Ile Cys Gln Leu
 450 455 460

Tyr Gln Glu Asn Arg Leu Glu Ala Met Arg Ala Tyr Ser Tyr Gln Ile
 465 470 475 480

Ala Glu Gly Phe Leu Thr Lys Glu Ile Leu Glu Lys Trp Lys Lys Thr
 485 490 495

Val Glu Glu Val Leu His Asp
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<210> 109

<211> 2292

<212> DNA

<213> Streptococcus pneumoniae

<400> 109

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<210> 110

<211> 763

<212> PRT

<213> Streptococcus pneumoniae

<400> 110

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Arg Gln Arg Leu Ser Glu Gly Glu Ser Leu Asp Asp Ile Leu Val Glu
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Ala Phe Ala Val Val Arg Glu Ala Asp Lys Arg Ile Leu Gly Met Phe
 35 40 45

Pro Tyr Asp Val Gln Val Met Gly Ala Ile Val Met His Tyr Gly Asn
 50 55 60

Val Ala Glu Met Asn Thr Gly Glu Gly Lys Thr Leu Thr Ala Thr Met
 65 70 75 80

Pro Val Tyr Leu Asn Ala Phe Ser Gly Glu Gly Val Met Val Val Thr
 85 90 95

Pro Asn Glu Tyr Leu Ser Lys Arg Asp Ala Glu Glu Met Gly Gln Val
 100 105 110

Tyr Arg Phe Leu Gly Leu Thr Ile Gly Val Pro Phe Thr Glu Asp Pro
 115 120 125

150

Lys Lys Glu Met Lys Ala Glu Glu Lys Lys Leu Ile Tyr Ala Ser Asp
130 135 140

Ile Ile Tyr Thr Thr Asn Ser Asn Leu Gly Phe Asp Tyr Leu Asn Asp
145 150 155 160

Asn Leu Ala Ser Asn Glu Glu Gly Lys Phe Leu Arg Pro Phe Asn Tyr
165 170 175

Val Ile Ile Asp Glu Ile Asp Asp Ile Leu Leu Asp Ser Ala Gln Thr
180 185 190

Pro Leu Ile Ile Ala Gly Ser Pro Arg Val Gln Ser Asn Tyr Tyr Ala
195 200 205

Ile Ile Asp Thr Leu Val Thr Thr Leu Val Glu Gly Glu Asp Tyr Ile
210 215 220

Phe Lys Glu Glu Lys Glu Glu Val Trp Leu Thr Thr Lys Gly Ala Lys
225 230 235 240

Ser Ala Glu Asn Phe Leu Gly Ile Asp Asn Leu Tyr Lys Glu Glu His
245 250 255

Ala Ser Phe Ala Arg His Leu Val Tyr Ala Ile Arg Ala His Lys Leu
260 265 270

Phe Thr Lys Asp Lys Asp Tyr Ile Ile Arg Gly Asn Glu Met Val Leu
275 280 285

Val Asp Lys Gly Thr Gly Arg Leu Met Glu Met Thr Lys Leu Gln Gly
290 295 300

Gly Leu His Gln Ala Ile Glu Ala Lys Glu His Val Lys Leu Ser Pro
305 310 315 320

Glu Thr Arg Ala Met Ala Ser Ile Thr Tyr Gln Ser Leu Phe Lys Met
325 330 335

Phe Asn Lys Ile Ser Gly Met Thr Gly Thr Gly Lys Val Ala Glu Lys
 340 345 350

Glu Phe Ile Glu Thr Tyr Asn Met Ser Val Val Arg Ile Pro Thr Asn
 355 360 365

Arg Pro Arg Gln Arg Ile Asp Tyr Pro Asp Asn Leu Tyr Ile Thr Leu
 370 375 380

Pro Glu Lys Val Tyr Ala Ser Leu Glu Tyr Ile Lys Gln Tyr His Ala
 385 390 395 400

Lys Gly Asn Pro Leu Leu Val Phe Val Gly Ser Val Glu Met Ser Gln
 405 410 415

Leu Tyr Ser Ser Leu Leu Phe Arg Glu Gly Ile Ala His Asn Val Leu
 420 425 430

Asn Ala Asn Asn Ala Ala Arg Glu Ala Gln Ile Ile Ser Glu Ser Gly
 435 440 445

Gln Met Gly Ala Val Thr Val Ala Thr Ser Met Ala Gly Arg Gly Thr
 450 455 460

Asp Ile Lys Leu Gly Lys Gly Val Ala Glu Leu Gly Gly Leu Ile Val
 465 470 475 480

Ile Gly Thr Glu Arg Met Glu Ser Gln Arg Ile Asp Leu Gln Ile Arg
 485 490 495

Gly Arg Ser Gly Arg Gln Gly Asp Pro Gly Met Ser Lys Phe Phe Val
 500 505 510

Ser Leu Glu Asp Asp Val Ile Lys Lys Phe Gly Pro Ser Trp Val His
 515 520 525

Lys Lys Tyr Lys Asp Tyr Gln Val Gln Asp Met Thr Gln Pro Glu Val
 530 535 540

Leu Lys Gly Arg Lys Tyr Arg Lys Leu Val Glu Lys Ala Gln His Ala
545 550 555 560

Ser Asp Ser Ala Gly Arg Ser Ala Arg Arg Gln Thr Leu Glu Tyr Ala
565 570 575

Glu Ser Met Asn Ile Gln Arg Asp Ile Val Tyr Lys Glu Arg Asn Arg
580 585 590

Leu Ile Asp Gly Ser Arg Asp Leu Glu Asp Val Val Val Asp Ile Ile
595 600 605

Glu Arg Tyr Thr Glu Glu Val Ala Ala Asp His Tyr Ala Ser Arg Glu
610 615 620

Leu Leu Phe His Phe Ile Val Thr Asn Ile Ser Phe His Val Lys Glu
625 630 635 640

Val Pro Asp Tyr Ile Asp Val Thr Asp Lys Thr Ala Val Arg Ser Phe
645 650 655

Met Lys Gln Val Ile Asp Lys Glu Leu Ser Glu Lys Lys Glu Leu Leu
660 665 670

Asn Gln His Asp Leu Tyr Glu Gln Phe Leu Arg Leu Ser Leu Leu Lys
675 680 685

Ala Ile Asp Asp Asn Trp Val Glu Gln Val Asp Tyr Leu Gln Gln Leu
690 695 700

Ser Met Ala Ile Gly Gly Gln Ser Ala Ser Gln Lys Asn Pro Ile Val
705 710 715 720

Glu Tyr Tyr Gln Glu Ala Tyr Ala Gly Phe Glu Ala Met Lys Glu Gln
725 730 735

Ile His Ala Asp Met Val Arg Asn Leu Leu Met Gly Leu Val Glu Val
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Thr Pro Lys Gly Glu Ile Val Thr His Phe Pro

755

760

<210> 111

<211> 879

<212> DNA

<213> Streptococcus pneumoniae

<400> 111

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<210> 112

<211> 292

<212> PRT

<213> Streptococcus pneumoniae

<400> 112

Met Lys Gln Glu Trp Phe Glu Ser Asn Asp Phe Val Lys Thr Thr Ser

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10

15

Lys Asn Lys Pro Glu Glu Gln Ala Gln Glu Val Ala Asp Lys Ala Glu
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Glu Arg Ile Pro Asp Leu Asp Thr Pro Ile Glu Lys Asn Thr Gln Leu
 35 40 45

Glu Glu Glu Val Ser Gln Ala Glu Val Glu Leu Glu Ser Gln Gln Glu
 50 55 60

Glu Lys Ile Glu Ala Pro Glu Asp Ser Glu Ala Arg Thr Glu Ile Glu
 65 70 75 80

Glu Lys Lys Ala Ser Asn Ser Thr Glu Glu Glu Pro Asp Leu Ser Lys
 85 90 95

Glu Thr Glu Lys Val Thr Ile Ala Glu Glu Ser Gln Glu Ala Leu Pro
 100 105 110

Gln Gln Lys Ala Thr Thr Lys Glu Pro Leu Leu Ile Ser Lys Ser Leu
 115 120 125

Glu Ser Pro Tyr Ile Pro Asp Gln Ala Pro Lys Ser Arg Asp Lys Trp
 130 135 140

Lys Glu Gln Val Leu Asp Phe Trp Ser Trp Leu Val Glu Ala Ile Lys
 145 150 155 160

Ser Pro Thr Ser Lys Leu Glu Thr Ser Ile Thr His Ser Tyr Thr Ala
 165 170 175

Phe Leu Leu Leu Ile Leu Phe Ser Ala Ser Ser Phe Phe Phe Ser Ile
 180 185 190

Tyr His Ile Lys His Ala Tyr Tyr Gly His Ile Ala Ser Ile Asn Ser
 195 200 205

Arg Phe Pro Glu Gln Leu Ala Pro Leu Thr Leu Phe Ser Ile Ile Ser
 210 215 220

155

Ile Leu Val Ala Thr Thr Leu Phe Phe Phe Ser Phe Leu Leu Gly Ser
225 230 235 240

Phe Val Val Arg Arg Phe Ile His Gln Glu Lys Asp Trp Thr Leu Asp
245 250 255

Lys Val Leu Gln Gln Tyr Ser Gln Leu Leu Ala Ile Pro Ile Ser Ser
260 265 270

Leu Leu Leu Leu Val Ser Leu Leu Ser Leu Ile Ala Tyr Asp Leu Gln
275 280 285

Pro Ser Cys Val
290

<210> 113

<211> 327

<212> DNA

<213> Streptococcus pneumoniae

<400> 113

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gggagtatcc gccatgacaa gaactga 327

<210> 114

<211> 108

<212> PRT

<213> Streptococcus pneumoniae

<400> 114

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5

10

15

Val Leu Glu Gln Gly Asp Ser Tyr Gly Tyr Glu Ile Ser Gln Thr Ile
 20 25 30

Lys Leu Ile Ala Asn Ile Lys Glu Ser Thr Leu Tyr Pro Ile Leu Lys
 35 40 45

Lys Leu Glu Gly Asn Ser Phe Leu Thr Thr Tyr Ser Arg Glu Phe Gln
 50 55 60

Gly Arg Met Arg Lys Tyr Tyr Ser Leu Thr Asn Gly Gly Ile Glu Gln
 65 70 75 80

Leu Leu Thr Leu Lys Asp Glu Trp Ala Leu Tyr Thr Asp Thr Ile Asn
 85 90 95

Gly Ile Ile Glu Gly Ser Ile Arg His Asp Lys Asn
 100 105

<210> 115

<211> 954

<212> DNA

<213> Streptococcus pneumoniae

<400> 115

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<210> 116
<211> 317
<212> PRT
<213> Streptococcus pneumoniae
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35 40 45

Glu Trp Leu Lys Thr Tyr Gln Phe Leu Leu Met Lys Ala Gly Gln Thr
65 70 75 80

Leu Leu Val Phe Ile Val Glu Glu Leu Phe Lys Glu Glu Glu Ile Thr
100 105 110

Thr Ser Leu Thr Lys Lys Val Asp Tyr Leu Gly Met Glu Val Asp Asp
130 135 140

158

Leu Leu Ile Asp Leu Ala Ala Ser Met Ala Asp Val Ile Gly Leu Gln
145 150 155 160

Ala Gly Phe Val Gln Gly Asp Ala Val Arg Pro Gln Met Leu Lys Glu
165 170 175

Ser Asp Val Val Ile Ser Asp Leu Pro Val Gly Tyr Tyr Pro Asp Asp
180 185 190

Ala Val Ala Ser Arg His Gln Val Ala Ser Ser Gln Glu His Thr Tyr
195 200 205

Ala His His Leu Leu Met Glu Gln Gly Leu Lys Tyr Leu Lys Ser Asp
210 215 220

Gly Tyr Ala Ile Phe Leu Ala Pro Ser Asp Leu Leu Thr Ser Pro Gln
225 230 235 240

Ser Asp Leu Leu Lys Glu Trp Leu Lys Glu Glu Ala Ser Leu Val Ala
245 250 255

Met Ile Ser Leu Pro Glu Asn Leu Phe Ala Asn Ala Lys Gln Ser Lys
260 265 270

Thr Ile Phe Ile Leu Gln Lys Lys Asn Glu Ile Ala Val Glu Pro Phe
275 280 285

Val Tyr Pro Leu Ala Ser Leu Gln Asp Ala Ser Val Leu Met Lys Phe
290 295 300

Lys Glu Asn Phe Gln Lys Trp Thr Gln Gly Thr Glu Ile
305 310 315

<210> 117

<211> 1902

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 117

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Asp Ile Ser Leu Ser Tyr Leu Ala Gln Asp Ser Arg Phe Glu Ser Glu

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Asn Thr Ile Tyr Asp Glu Met Leu His Val Phe Asn Asp Leu Arg Arg

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90

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1099240-923200

161

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Asp Gly Glu Val Leu Ser Gln Pro Ile Asn Leu Asp Leu Arg Lys Met
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Gly Ala Leu Ile Val Ala Asn Ile Val Gln Ala Ile Ala Phe Ala Phe

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Ser Arg Thr Ala Asn Lys Ala Ile Ile Thr Glu Val Val Glu Lys Asp

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Ser Ser Glu Gln Ile Ser Glu Asn Leu Lys Lys Ala Ile Ile Ala Thr
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Glu	Ile	Gly	Leu	Arg	Arg	Ala	Lys	Ala	Val	Leu	Tyr	Ser	Met	Tyr	Arg		
290						295						300					
Thr	Gly	Ala	Leu	Ser	Lys	Asp	Glu	Tyr	Ser	Gln	Tyr	Lys	Asp	Tyr	Asp		
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Leu	Lys	Gln	Asp	Phe	Leu	Pro	Ser	Gly	Thr	Val	Thr	Gly	Ile	Ser	Arg		
325						330						335					
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Thr	Gly	Arg	Val	Glu	Val	Gly	Asn	Val	Leu	Met	Asp	Asn	Gln	Thr	Gly		
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Asn Gly Val Tyr His Gln Lys His Val Ile Ser Lys Ile Glu Ala Ala
580 585 590

Asp Gly Arg Val Val Tyr Glu Tyr Gln Asp Lys Pro Val Gln Val Tyr
595 600 605

Ser Lys Ala Thr Ala Thr Ile Met Gln Gly Leu Leu Arg Glu Val Leu
610 615 620

Ser Ser Arg Val Thr Thr Thr Phe Lys Ser Asn Leu Thr Ser Leu Asn
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Gln Asp Glu Asn Met Trp Leu Met Leu Ser Thr Pro Arg Leu Thr Leu
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<211> 657

<212> PRT

<213> Streptococcus pneumoniae

<400> 124

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20

25

30

Leu Leu Thr Val Leu Ile Leu Phe Leu Phe Val Gly Gly Tyr Val Phe

35

40

45

Leu Phe Lys Lys Leu Arg Val His Tyr Thr Arg Ser Asp Val Glu Gln

50

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60

Ile Gln Tyr Val Asn His Gln Ala Glu Glu Ser Leu Thr Ala Leu Leu

65

70

75

80

Glu Gln Met Pro Val Gly Val Met Lys Leu Asn Leu Ser Ser Gly Glu

85

90

95

Val Glu Trp Phe Asn Pro Tyr Ala Glu Leu Ile Leu Thr Lys Glu Asp

100

105

110

Gly Asp Phe Asp Leu Glu Ala Val Gln Thr Ile Ile Lys Ala Ser Val

115

120

125

Gly Asn Pro Ser Thr Tyr Ala Lys Leu Gly Glu Lys Arg Tyr Ala Val

130

135

140

His Met Asp Ala Ser Ser Gly Val Leu Tyr Phe Val Asp Val Ser Arg

145

150

155

160

Glu Gln Ala Ile Thr Asp Glu Leu Val Thr Ser Arg Pro Val Ile Gly

165

170

175

Ile Val Ser Val Asp Asn Tyr Asp Asp Leu Glu Asp Glu Thr Ser Glu

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185

190

P09269260

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Phe	Tyr	Leu	Phe	Thr	Asp	Tyr	Thr	Val	Leu	Glu	Gly	Leu	Met	Asn	Asp	
	225					230				235					240	
Lys	Phe	Ser	Val	Ile	Asp	Ala	Phe	Arg	Glu	Glu	Ser	Lys	Gln	Arg	Gln	
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175

Val Lys Asp Ala Met Gly Met Val Thr Asn Arg Ser Leu Leu Ile Leu
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Val Asp His Ser Lys Thr Ala Leu Thr Leu Ser Lys Glu Phe Tyr Asp
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Leu Phe Thr Gln Thr Ile Val Ile Asp His His Arg Arg Asp Gln Asp
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Phe Pro Asp Asn Ala Val Ile Thr Tyr Ile Glu Ser Gly Ala Ser Ser
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Ala Ser Glu Leu Val Thr Glu Leu Ile Gln Phe Gln Asn Ser Lys Lys
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Asn Arg Leu Ser Arg Met Gln Ala Ser Val Leu Met Ala Gly Met Met
485 490 495

Leu Asp Thr Lys Asn Phe Thr Ser Arg Val Thr Ser Arg Thr Phe Asp
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Val Ala Ser Tyr Leu Arg Thr Arg Gly Ser Asp Ser Ile Ala Ile Gln
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Lys Asp Met Lys Cys Tyr Asp Thr Val Val Ile Ser Lys Ala Ala Asp
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Ala Met Leu Ala Met Ser Gly Ile Glu Ala Ser Phe Val Leu Ala Lys
580 585 590

Asn Thr Gln Gly Phe Ile Ser Ile Ser Ala Arg Ser Arg Ser Lys Leu
595 600 605

Asn Val Gln Arg Ile Met Glu Glu Leu Gly Gly Gly Gly His Phe Asn
 610 615 620

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<211> 663

<212> DNA

<213> Streptococcus pneumoniae

<400> 125

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<211> 220

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<213> Streptococcus pneumoniae

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Lys Glu Tyr Gln Phe Val Val Ile Pro Leu Ser Pro Asp Arg Tyr Ala
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Asn Arg Gly Phe Asn Gln Val Glu Gly Leu Val Glu Ala Ala Gly Phe
130 135 140

Glu Tyr Leu Asp Leu Leu Glu Lys Arg Glu Glu Arg Ala Ser Ser Ser
145 150 155 160

Lys Asn Arg Ser Glu Arg Leu Gly Thr Glu Leu Pro Phe Phe Ile Lys
165 170 175

Ser Gly Val Thr Ile Pro Lys Lys Ile Leu Leu Ile Asp Asp Ile Tyr
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<212> DNA

<213> Streptococcus pneumoniae

<400> 127

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<213> Streptococcus pneumoniae

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Ala Phe Pro Tyr Val Asp Asn Pro Met Leu Tyr His Ala Val Lys Asn
210 215 220

Ser Val Lys Glu Asn Gly Leu Arg Ile Phe Leu Thr Ala Thr Ser Thr
225 230 235 240

Asn Glu Leu Asp Lys Lys Val Arg Leu Gly Glu Leu Lys Arg Leu Asn
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Leu Pro Arg Arg Phe His Gly Asn Pro Leu Ile Ile Pro Lys Pro Ile
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Trp Leu Ser Asp Phe Asn Arg Tyr Leu Asp Lys Asn Arg Leu Ser Pro
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Lys Leu Lys Ser Tyr Ile Glu Lys Gln Arg Lys Thr Ala Tyr Pro Leu
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325 330 335

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Thr Ile Leu Ile Ser Thr Thr Ile Leu Glu Arg Gly Val Thr Phe Pro
355 360 365

Cys Val Asp Val Phe Val Val Glu Ala Asn His Arg Leu Phe Thr Lys
370 375 380

Ser Ser Leu Ile Gln Ile Gly Gly Arg Val Gly Arg Ser Met Asp Arg
 385 390 395 400

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<211> 870

<212> DNA

<213> Streptococcus pneumoniae

<400> 129

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<211> 289

<212> PRT

<213> Streptococcus pneumoniae

<400> 130

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20

25

30

Ala Ile Gln Thr Leu Lys Glu Val Asp Trp Ile Ala Ala Glu Asp Thr

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40

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Arg Asn Thr Gly Leu Leu Leu Lys His Phe Asp Ile Ser Thr Lys Gln

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60

Ile Ser Phe His Glu His Asn Ala Lys Glu Lys Ile Pro Asp Leu Ile

65

70

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Gly Phe Leu Lys Ala Gly Gln Ser Ile Ala Gln Val Ser Asp Ala Gly

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Leu Pro Ser Ile Ser Asp Pro Gly His Asp Leu Val Lys Ala Ala Ile

100

105

110

Glu Glu Glu Ile Ala Val Val Thr Val Pro Gly Ala Ser Ala Gly Ile

115

120

125

Ser Ala Leu Ile Ala Ser Gly Leu Ala Pro Gln Pro His Ile Phe Tyr

130

135

140

Gly Phe Leu Pro Arg Lys Ser Gly Gln Gln Lys Gln Phe Phe Gly Leu

145

150

155

160

Lys Lys Asp Tyr Pro Glu Thr Gln Ile Phe Tyr Glu Ser Pro His Arg

165

170

175

Val Ala Asp Thr Leu Glu Asn Met Leu Glu Val Tyr Gly Asp Arg Ser
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Val Val Leu Val Arg Glu Leu Thr Lys Ile Tyr Glu Glu Tyr Gln Arg
 195 200 205

Gly Thr Ile Ser Glu Leu Leu Glu Ser Ile Ala Glu Thr Pro Leu Lys
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<210> 131

<211> 345

<212> DNA

<213> Streptococcus pneumoniae

<400> 131

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 aagagcctgg tagaggaaaa tacagctctt cgcttggaat atagtaagtt gcgagaacgc 180
 ttgggtgagg tggaagcaga tgctcctgtc aaggccaagc atgttcgcga aagtgtccgt 240
 cgtatttacc gtgatggatt tcacgtatgt aatgattttt atggacaacg tcgagagcag 300
 gacgaagaat gtatgttttg tgacgagttg ttatacaggg agtaa 345

<210> 132

<211> 114

<212> PRT

<213> Streptococcus pneumoniae

<400> 132

Met Ile Lys Lys Gly Lys Gly Cys Phe Met Asp Lys Lys Glu Leu Phe

1

5

10

15

Asp Ala Leu Asp Asp Phe Ser Gln Gln Leu Leu Val Thr Leu Ala Asp

20

25

30

Val Glu Ala Ile Lys Lys Asn Leu Lys Ser Leu Val Glu Glu Asn Thr

35

40

45

Ala Leu Arg Leu Glu Asn Ser Lys Leu Arg Glu Arg Leu Gly Glu Val

50

55

60

Glu Ala Asp Ala Pro Val Lys Ala Lys His Val Arg Glu Ser Val Arg

65

70

75

80

Arg Ile Tyr Arg Asp Gly Phe His Val Cys Asn Asp Phe Tyr Gly Gln

85

90

95

Arg Arg Glu Gln Asp Glu Glu Cys Met Phe Cys Asp Glu Leu Leu Tyr

100

105

110

Arg Glu

<210> 133

<211> 639

<212> DNA

<213> Streptococcus pneumoniae

atgtcaaaag	gatttttagt	ctctcttgag	ggaccagagg	gagcaggcaa	gaccagtgtt	60
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cctggcggag	tcttgattgg	ggagaagatt	cgggaagtga	ttttggatcc	aagtcatact	180
cagatggatg	ctaaaacaga	gctacttctc	tatattgcca	gtcgcagaca	gcatttggtg	240
gaaaaagttc	ttccagccct	tgaagctggc	aagtgggtca	tcatggatcg	ttttatcgat	300
agttctgttg	cctatcaggg	atttggtcgt	ggcttagata	ttgaagccat	tgactggctc	360
aatcagtttg	cgacagatgg	cctcaaacc	gatttgacac	tctattttga	catcgagggtg	420
gaagaagggc	tggtctgtat	tgctgcta	agtgaccgcg	aggttaatcg	tttggtattg	480
gaagggttg	acttgcataa	aaaagtctgt	caaggctacc	tttctcttct	ggataaagag	540
ggaaatcgca	ttgtcaagat	tgatgctagt	ctcccttttg	agcaagttgt	ggaaactacc	600
aaggctgtct	tgtttgacgg	aatgggcttg	gccaaatga			639

<213> Streptococcus pneumoniae

Met Ser Lys Gly Phe Leu Val Ser Leu Glu Gly Pro Glu Gly Ala Gly
1 5 10 15

Lys Thr Ser Val Leu Glu Ala Leu Leu Pro Ile Leu Glu Glu Lys Gly
20 25 30

Val Glu Val Leu Thr Thr Arg Glu Pro Gly Gly Val Leu Ile Gly Glu
35 40 45

Lys Ile Arg Glu Val Ile Leu Asp Pro Ser His Thr Gln Met Asp Ala
50 55 60

Lys Thr Glu Leu Leu Leu Tyr Ile Ala Ser Arg Arg Gln His Leu Val
65 70 75 80

Glu Lys Val Leu Pro Ala Leu Glu Ala Gly Lys Leu Val Ile Met Asp
85 90 95

186

Arg Phe Ile Asp Ser Ser Val Ala Tyr Gln Gly Phe Gly Arg Gly Leu
100 105 110

Asp Ile Glu Ala Ile Asp Trp Leu Asn Gln Phe Ala Thr Asp Gly Leu
115 120 125

Lys Pro Asp Leu Thr Leu Tyr Phe Asp Ile Glu Val Glu Glu Gly Leu
130 135 140

Ala Arg Ile Ala Ala Asn Ser Asp Arg Glu Val Asn Arg Leu Asp Leu
145 150 155 160

Glu Gly Leu Asp Leu His Lys Lys Val Arg Gln Gly Tyr Leu Ser Leu
165 170 175

Leu Asp Lys Glu Gly Asn Arg Ile Val Lys Ile Asp Ala Ser Leu Pro
180 185 190

Leu Glu Gln Val Val Glu Thr Thr Lys Ala Val Leu Phe Asp Gly Met
195 200 205

Gly Leu Ala Lys
210

<210> 135

<211> 474

<212> DNA

<213> Streptococcus pneumoniae

<400> 135

atggtagaac aaagaaaatc aattaccatg aaagatgttg ctttagaagc aggagttagt 60
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aaagtggaac aagcgattaa aactttgaat tacattccag attactacgc tagaggaatg 180
aaaaaaaatc gaacagaaac gattgcaatc attgtaccaa gtatctggca tcccttcttt 240
tcagaatttg ctatgcatgt ggaaaatgaa gtctataaga gaaataacaa attactctta 300
tgttctatca atggtacaaa tagagagcaa gactatctgg agatgttgcg tcataataaa 360

<213> Streptococcus pneumoniae

Tyr Arg Pro Ile Glu His Tyr Leu Thr Ser Gly Ile Pro Phe Val Ser
130 135 140

Ile Asp Arg Thr Tyr Ser Glu Ile Ala Ile Pro Cys Val Ser
 145 150 155

<210> 137

<211> 374

<212> DNA

<213> Streptococcus pneumoniae

<400> 137

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 atcacaggta ctgcagctgc aacacttgct ggcccagccc tagtgatttc aatcgttatt 180
 tctgccttgt gtgtgggatt atcagccctc ttttttgcag aatttgctc gcgagtaccc 240
 gctacaggag gtgcctatag ttacctctat gctatcttag gagaattccc tgccgtggtg 300
 gctgggttgg taacctgat ggagttcatg acagccatat caggcgtagc ttcgggttgg 360
 gcagcttatt ttaa 374

<210> 138

<211> 124

<212> PRT

<213> Streptococcus pneumoniae

<400> 138

Met Asn Ile Phe Arg Thr Lys Asn Val Ser Leu Asp Lys Thr Glu Met
 1 5 10 15
 His Arg His Leu Lys Leu Trp Asp Leu Ile Leu Leu Gly Ile Gly Ala
 20 25 30
 Met Val Gly Thr Gly Val Phe Thr Ile Thr Gly Thr Ala Ala Ala Thr
 35 40 45
 Leu Ala Gly Pro Ala Leu Val Ile Ser Ile Val Ile Ser Ala Leu Cys
 50 55 60

Val Gly Leu Ser Ala Leu Phe Phe Ala Glu Phe Ala Ser Arg Val Pro
 65 70 75 80

Ala Thr Gly Gly Ala Tyr Ser Tyr Leu Tyr Ala Ile Leu Gly Glu Phe
 85 90 95

Pro Ala Trp Leu Ala Gly Trp Leu Thr Met Met Glu Phe Met Thr Ala
 100 105 110

Ile Ser Gly Val Ala Ser Gly Trp Ala Ala Tyr Phe
 115 120

<210> 139

<211> 1311

<212> DNA

<213> Streptococcus pneumoniae

<400> 139

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 gcgactattc tagcaagtga aggaaagacc gtcttgacaga atgttccgat tttgtcggat 180
 gtctttatta tgaatcaggt agttggtggt ttgaatgcca aggttgactt tgatgaggaa 240
 gctcatcttg tcaagggtga tgctactggc gacatcactg aggaagcccc ttacaagtat 300
 gtcagcaaga tgcgcgcctc catcggttga ttagggccaa tccttgcccg tgtgggtcat 360
 gccaaaggtat ccatgccagg tgggtgtacg attggtagcc gtcctattga tcttcatttg 420
 aaaggtcttg aagctatggg gggttaagatt agtcagacag ctggttacat cgaagccaag 480
 gcagaacgct tgcattggtc tcatatctat atggactttc caagtgttg tgcaacgcag 540
 aacttgatga tggcagcgac tctggctgat ggggtgacag tgattgagaa tgctgcgcgt 600
 gagcctgaga ttgttgactt agccattctc cttaatgaaa tgggagccaa ggtcaaaggt 660
 gctggtacag agactataac cattactggt gttgagaaac ttcattggtac gactcacaat 720
 gtagtccaag accgtatcga agcaggaacc tttatggttag ctgctgccat gactggtggt 780
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 gaaatgggtg ttgaagtaat tgaagaagac gaaggaattc gtgttcgttc tcaactagaa 900
 aatctaaaag ctgttcatgt gaaaaccttg cccacccag gatttccaac agatatgcag 960
 gctcaattta cagccttgat gacagttgca aaaggcgaat caaccatggt ggagacagtt 1020
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0076736-0360

```
<210> 140
<211> 436
<212> PRT
<213> Streptococcus pneumoniae
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Met Lys Ser Arg Val Lys Glu Thr Ser Met Asp Lys Ile Val Val Gln
1 5 10 15

Asn Ala Val Leu Pro Leu Leu Ala Ala Thr Ile Leu Ala Ser Glu Gly
35 40 45

Asn Gln Val Val Gly Gly Leu Asn Ala Lys Val Asp Phe Asp Glu Glu
65 70 75 80

Pro Tyr Lys Tyr Val Ser Lys Met Arg Ala Ser Ile Val Val Leu Gly
100 105 110

Cys Thr Ile Gly Ser Arg Pro Ile Asp Leu His Leu Lys Gly Leu Glu
130 135 140

191

Ala Met Gly Val Lys Ile Ser Gln Thr Ala Gly Tyr Ile Glu Ala Lys
145 150 155 160

Ala Glu Arg Leu His Gly Ala His Ile Tyr Met Asp Phe Pro Ser Val
165 170 175

Gly Ala Thr Gln Asn Leu Met Met Ala Ala Thr Leu Ala Asp Gly Val
180 185 190

Thr Val Ile Glu Asn Ala Ala Arg Glu Pro Glu Ile Val Asp Leu Ala
195 200 205

Ile Leu Leu Asn Glu Met Gly Ala Lys Val Lys Gly Ala Gly Thr Glu
210 215 220

Thr Ile Thr Ile Thr Gly Val Glu Lys Leu His Gly Thr Thr His Asn
225 230 235 240

Val Val Gln Asp Arg Ile Glu Ala Gly Thr Phe Met Val Ala Ala Ala
245 250 255

Met Thr Gly Gly Asp Val Leu Ile Arg Asp Ala Val Trp Glu His Asn
260 265 270

Arg Pro Leu Ile Ala Lys Leu Leu Glu Met Gly Val Glu Val Ile Glu
275 280 285

Glu Asp Glu Gly Ile Arg Val Arg Ser Gln Leu Glu Asn Leu Lys Ala
290 295 300

Val His Val Lys Thr Leu Pro His Pro Gly Phe Pro Thr Asp Met Gln
305 310 315 320

Ala Gln Phe Thr Ala Leu Met Thr Val Ala Lys Gly Glu Ser Thr Met
325 330 335

Val Glu Thr Val Phe Glu Asn Arg Phe Gln His Leu Glu Glu Met Arg
340 345 350

<400> 141						
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gaagttcttt	ggactgcacg	tagtgttgag	caaatccaaa	acgatttgac	taaaacggac	120
aacaaaacaa	gttataccgt	acagtatggt	gatactttga	gcaccattgc	agaagccttg	180
ggtgtagatg	tcacagtgct	tgcgaaatctg	aacaaaatca	ctaatatgga	cttgattttc	240
ccagaaactg	ttttgacaac	gactgtcaat	gaagcagaag	aagtaacaga	agttgaaatc	300
caaacacctc	aagcagactc	tagtgaagaa	gtgacaactg	cgacagcaga	tttgaccact	360
aatcaagtga	ccgttgatga	tcaaactggt	caggttgcag	acctttctca	accaattgca	420
gaagttacaa	agacagtgat	tgcttctgaa	gaagtggcac	catctacggg	cacttctgtc	480
ccagaggagc	aaacgaccga	aacaactcgc	ccagttgcag	aagaagctcc	tcaggaaacg	540
actccagctg	agaagcagga	aacacaaaca	agccctcaag	ctgcatcagc	agtggaagca	600
actacaacaa	gttcagaagc	aaaagaagta	gcatcatcaa	atggagctac	agcagcagtt	660
tctactttatc	aaccagaaga	aacgaaagta	atttcaacaa	cttacgaggc	tccagctgcg	720


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cccgattatg ctggacttgc agtagcaaaa tctgaaaatg caggtcttca accacaaaca 780
gctgccttta agaagaaatt gctaacttgt ttggcattac atcctttagt gggtatcgtc 840
caggagacag tggagatcac ggaaaagggt tggctatcga ctttatggta ccagaacgtt 900
cagaattagg ggataagatt gcggaatatg ctattcaaaa tatggccagc cgtggcatta 960
gttacatcat ctggaaacaa cgtttctatg ctccattcga tagcaaatat gggccagcta 1020
acacttggaa cccaatgcca gaccgtggtg gtgtgacaga aaatcactat gatcacgttc 1080
acgtttcaat gaatggataa                                     1100

```

<210> 142

<211> 302

<212> PRT

<213> Streptococcus pneumoniae

<400> 142

```

Met Leu Leu Ala Ser Thr Val Ala Leu Ser Phe Ala Pro Val Leu Ala
  1              5              10             15

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Thr Gln Ala Glu Glu Val Leu Trp Thr Ala Arg Ser Val Glu Gln Ile
          20              25             30

```

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Gln Asn Asp Leu Thr Lys Thr Asp Asn Lys Thr Ser Tyr Thr Val Gln
          35              40             45

```

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Tyr Gly Asp Thr Leu Ser Thr Ile Ala Glu Ala Leu Gly Val Asp Val
          50              55             60

```

```

Thr Val Leu Ala Asn Leu Asn Lys Ile Thr Asn Met Asp Leu Ile Phe
          65              70             75             80

```

```

Pro Glu Thr Val Leu Thr Thr Thr Val Asn Glu Ala Glu Glu Val Thr
          85              90             95

```

```

Glu Val Glu Ile Gln Thr Pro Gln Ala Asp Ser Ser Glu Glu Val Thr
          100             105            110

```

```

Thr Ala Thr Ala Asp Leu Thr Thr Asn Gln Val Thr Val Asp Asp Gln
          115             120            125

```

194

Thr Val Gln Val Ala Asp Leu Ser Gln Pro Ile Ala Glu Val Thr Lys
130 135 140

Thr Val Ile Ala Ser Glu Glu Val Ala Pro Ser Thr Gly Thr Ser Val
145 150 155 160

Pro Glu Glu Gln Thr Thr Glu Thr Thr Arg Pro Val Ala Glu Glu Ala
165 170 175

Pro Gln Glu Thr Thr Pro Ala Glu Lys Gln Glu Thr Gln Thr Ser Pro
180 185 190

Gln Ala Ala Ser Ala Val Glu Ala Thr Thr Thr Ser Ser Glu Ala Lys
195 200 205

Glu Val Ala Ser Ser Asn Gly Ala Thr Ala Ala Val Ser Thr Tyr Gln
210 215 220

Pro Glu Glu Thr Lys Val Ile Ser Thr Thr Tyr Glu Ala Pro Ala Ala
225 230 235 240

Pro Asp Tyr Ala Gly Leu Ala Val Ala Lys Ser Glu Asn Ala Gly Leu
245 250 255

Gln Pro Gln Thr Ala Ala Phe Lys Lys Lys Leu Leu Thr Cys Leu Ala
260 265 270

Leu His Pro Leu Val Val Ile Val Gln Glu Thr Val Glu Ile Thr Glu
275 280 285

Lys Val Trp Leu Ser Thr Leu Trp Tyr Gln Asn Val Gln Asn
290 295 300

109260-94260

<210> 143

<211> 1281

<212> DNA

<213> Streptococcus pneumoniae

<400> 143

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atttcagggg tttcagtagc tggtaatatc atcaccattt atcagggcgt tttcatcgct 180
ctgggagctg ctatttccag tggtatttca aaaagcatag ggcagaaaga ccagtcgaag 240
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gctgagagtg gtggactgta tctatctttg gtaggcggat cgattgttct cttaggttta 420
atgactagtc taggagcctt gattcgtgca acgcataatc cacgtctgcc tctctatgtt 480
agttttttat ccaatgcctt gaatatctt ttttcaagtc tagctatttt tgttctggat 540
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ttgtggtcac aattaaaact gccttatggg aagccaactt ttggtttaga taaggaactg 660
ttgaccttgg ctttaccagc agctggagag cgacttatga tgagggctgg agatgtagtg 720
atcattgcct tggtcgtttc ttttgggacg gaggcagttg ctgggaaatgc aatcggagaa 780
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cagggattag gaaatgcacg cctccctttt tatgcgacaa gtataggaat gtggtgtatc 1140
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```

<210> 144

<211> 426

<212> PRT

<213> Streptococcus pneumoniae

<400> 144

Leu Phe Lys Lys Asn Lys Asp Ile Leu Asn Ile Ala Leu Pro Ala Met

1

5

10

15

Gly Glu Asn Phe Leu Gln Met Leu Met Gly Met Val Asp Ser Tyr Leu
 20 25 30

Val Ala His Leu Gly Leu Ile Ala Ile Ser Gly Val Ser Val Ala Gly
 35 40 45

Asn Ile Ile Thr Ile Tyr Gln Ala Ile Phe Ile Ala Leu Gly Ala Ala
 50 55 60

Ile Ser Ser Val Ile Ser Lys Ser Ile Gly Gln Lys Asp Gln Ser Lys
 65 70 75 80

Leu Ala Tyr His Val Thr Glu Ala Leu Lys Ile Thr Leu Leu Leu Ser
 85 90 95

Phe Leu Leu Gly Phe Leu Ser Ile Phe Ala Gly Lys Glu Met Ile Gly
 100 105 110

Leu Leu Gly Thr Glu Arg Asp Val Ala Glu Ser Gly Gly Leu Tyr Leu
 115 120 125

Ser Leu Val Gly Gly Ser Ile Val Leu Leu Gly Leu Met Thr Ser Leu
 130 135 140

Gly Ala Leu Ile Arg Ala Thr His Asn Pro Arg Leu Pro Leu Tyr Val
 145 150 155 160

Ser Phe Leu Ser Asn Ala Leu Asn Ile Leu Phe Ser Ser Leu Ala Ile
 165 170 175

Phe Val Leu Asp Met Gly Ile Ala Gly Val Ala Trp Gly Thr Ile Val
 180 185 190

Ser Arg Leu Val Gly Leu Val Ile Leu Trp Ser Gln Leu Lys Leu Pro
 195 200 205

Tyr Gly Lys Pro Thr Phe Gly Leu Asp Lys Glu Leu Leu Thr Leu Ala
 210 215 220

Leu Pro Ala Ala Gly Glu Arg Leu Met Met Arg Ala Gly Asp Val Val
 225 230 235 240

Ile Ile Ala Leu Val Val Ser Phe Gly Thr Glu Ala Val Ala Gly Asn
 245 250 255

Ala Ile Gly Glu Val Leu Thr Gln Phe Asn Tyr Met Pro Ala Phe Gly
 260 265 270

Val Ala Thr Ala Thr Val Met Leu Leu Ala Arg Ala Val Gly Glu Asp
 275 280 285

Asp Trp Lys Arg Val Ala Ser Leu Ser Lys Gln Thr Phe Trp Leu Ser
 290 295 300

Leu Phe Leu Met Leu Pro Leu Ser Phe Ser Ile Tyr Val Leu Gly Val
 305 310 315 320

Pro Leu Thr His Leu Tyr Thr Thr Asp Ser Leu Ala Val Glu Ala Ser
 325 330 335

Val Leu Val Thr Leu Phe Ser Leu Leu Gly Thr Pro Met Thr Thr Gly
 340 345 350

Thr Val Ile Tyr Thr Ala Val Trp Gln Gly Leu Gly Asn Ala Arg Leu
 355 360 365

Pro Phe Tyr Ala Thr Ser Ile Gly Met Trp Cys Ile Arg Ile Gly Thr
 370 375 380

Gly Tyr Leu Met Gly Ile Val Leu Gly Trp Gly Leu Pro Gly Ile Trp
 385 390 395 400

Ala Gly Ser Leu Leu Asp Asn Gly Phe Arg Trp Leu Phe Leu Arg Tyr
 405 410 415

Arg Tyr Gln Arg Tyr Met Ser Leu Lys Gly
 420 425

109000-9229200

<210> 145

<211> 894

<212> DNA

<213> Streptococcus pneumoniae

<400> 145

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cagttatctc gctttgagct tggggagtct gacctggcag tctcccgttt ctttgagatt 180
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gatatgaagc aggatgattt gggtaaggta gcagattatc tottcaaaac agaagaatgg 480
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ttttataatg ccaactattt tgaggcttat acagagaaga ttattgacaa aggtattaag 720
ctttatgagc gtaatgtttt ccattattta aaagggtttg ccttatatca aaaaggacag 780
tgtaaagaag gctgtaagca gatgcaagag gccatgcata tttttgatgt gttaggctct 840
ccagagcaag tagcctatta tcaggaacac tacgaaaaat ttgtcaaaag ttaa      894

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<210> 146

<211> 297

<212> PRT

<213> Streptococcus pneumoniae

<400> 146

```

Val Gly Arg Ile Ile Arg Ala Gly Val Lys Met Glu His Leu Gly Lys
  1             5             10             15

```

```

Val Phe Arg Glu Phe Arg Thr Ser Gly Asn Tyr Ser Leu Lys Glu Ala
      20             25             30

```

Asn Tyr Phe Glu Ala Tyr Thr Glu Lys Ile Ile Asp Lys Gly Ile Lys
225 230 235 240

200

Leu Tyr Glu Arg Asn Val Phe His Tyr Leu Lys Gly Phe Ala Leu Tyr
245 250 255

Gln Lys Gly Gln Cys Lys Glu Gly Cys Lys Gln Met Gln Glu Ala Met
260 265 270

His Ile Phe Asp Val Leu Gly Leu Pro Glu Gln Val Ala Tyr Tyr Gln
275 280 285

Glu His Tyr Glu Lys Phe Val Lys Ser
290 295

<210> 147

<211> 1068

<212> DNA

<213> Streptococcus pneumoniae

<400> 147

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cagcgccgta ttctttattc tatgaataag gatagcaata cttttgacaa gagctaccgt 180
aagtcggcca agtcagtcgg gaacatcatg gggaatttcc acccacacgg ggattcttct 240
atctatgatg ccatgggttc tatgtcacag aactggaaaa atcgtgagat tctagtgtgaa 300
atgcacggta ataacggttc tatggacgga gatcctcctg cggctatgct ttatactgag 360
gcacgtttgt ctgaaattgc aggctacctt cttcaggata tcgagaaaaa gacagttcct 420
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ggtcgtgatg aaatcaagaa agcttatgag actgggaaaag ggcgcgtggt tgttcgttcc 720
aagactgaaa ttgaaaagct aaaagggtgg aaggaacaaa tcgttattat tgagattcct 780
tatgaaatca ataaggccaa tctagtcaag aaaatcgatg atgttcgtgt taataacaag 840
gtagctggga ttgctgaggt tcgtgatgag tctgaccgtg atggctcttcg tctcgtatc 900
gaacttaaga aagacgctaa tactgagctt gttctcaact acttatttaa gtacaccgac 960
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ggattgttcc aatcctgtct agctatatcg ctcaccgtcg agaagtga 1068

<210> 148

<211> 355

<212> PRT

<213> Streptococcus pneumoniae

<400> 148

Met Ser Asn Ile Gln Asn Met Ser Leu Glu Asp Ile Met Gly Glu Arg

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Phe Gly Arg Tyr Ser Lys Tyr Ile Ile Gln Asp Arg Ala Leu Pro Asp

20 25 30

Ile Arg Asp Gly Leu Lys Pro Val Gln Arg Arg Ile Leu Tyr Ser Met

35 40 45

Asn Lys Asp Ser Asn Thr Phe Asp Lys Ser Tyr Arg Lys Ser Ala Lys

50 55 60

Ser Val Gly Asn Ile Met Gly Asn Phe His Pro His Gly Asp Ser Ser

65 70 75 80

Ile Tyr Asp Ala Met Val Arg Met Ser Gln Asn Trp Lys Asn Arg Glu

85 90 95

Ile Leu Val Glu Met His Gly Asn Asn Gly Ser Met Asp Gly Asp Pro

100 105 110

Pro Ala Ala Met Arg Tyr Thr Glu Ala Arg Leu Ser Glu Ile Ala Gly

115 120 125

Tyr Leu Leu Gln Asp Ile Glu Lys Lys Thr Val Pro Phe Ala Trp Asn

130 135 140

Phe Asp Asp Thr Glu Lys Glu Pro Thr Val Leu Pro Ala Ala Phe Pro

145 150 155 160

[illegible]

Val Glu Lys
355

<210> 149

<211> 684

<212> DNA

<213> Streptococcus pneumoniae

<400> 149

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gcgcgtgcag gctataaaac tcttttgatc gatggcgata ctcgaaattc agttatgtta 240
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gatttatctc acggtttatg tgatacaaat attgaaaatt tatttgtagt tcaatcggga 360
tctgtatcac caaacctac agccttggtta caaagtaaaa attttaatga tatgattgaa 420
acattgcgta aatattttga ttatatcatt attgatacac cgctattgg aattggtatt 480
gatgcggcaa ttatcactca aaagtgtgat gcgtccatct tggtaacagc aacagggtgag 540
gcgaataaac gtgatatcca aaaagcgaaa caacaattaa aacaaacagg gaaactgttc 600
ctaggagttg ttttaaataa attggatatc tcggttaata agtatggagt ttacgggttc 660
tatggaaatt atggtaaaaa ataa                                     684

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<210> 150

<211> 227

<212> PRT

<213> Streptococcus pneumoniae

<400> 150

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Met Pro Thr Leu Glu Ile Ala Gln Lys Lys Leu Glu Phe Ile Lys Lys
  1             5             10             15

```

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Ala Glu Glu Tyr Tyr Asn Ala Leu Cys Thr Asn Ile Gln Leu Ser Gly
      20             25             30

```

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Asp Lys Leu Lys Val Ile Ser Val Thr Ser Val Asn Pro Gly Glu Gly
      35             40             45

```

Gly Lys Lys
225

<210> 151

<211> 1194

<212> DNA

<213> Streptococcus pneumoniae

<400> 151

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atggaggcaa atatgaaaca tctaaaaaca ttttacaaaa aatgggtttca attattagtc 60
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caaaaaagta gtgtaaaca ctctaacaac aatagtacta ttacacaaac tgcctataag 180
aacgaaaatt caacaacaca ggctgttaac aaagtaaaag atgctgttgt ttctgttatt 240
acttattcgg caaacagaca aaatagcgta tttggcaatg atgatactga cacagattct 300
cagcgaatct ctagtgaagg atctggagtt atttataaaa agaataataa agaagcttac 360
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ccactgatca atattcaagg gcagggtatc ggaattacct caagtaaaat tgctacaaat 780
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gctctttaca accattctat cggagacacc attaagataa cctactatcg taacgggaaa 1140
gaagaaacta cctctatcaa acttaacaag agttcaggtg atttagaatc ttaa      1194

```

<210> 152

<211> 397

<212> PRT

<213> Streptococcus pneumoniae

<400> 152

Met Glu Ala Asn Met Lys His Leu Lys Thr Phe Tyr Lys Lys Trp Phe

1

5

10

15

Gln Leu Leu Val Val Ile Val Ile Ser Phe Phe Ser Gly Ala Leu Gly
 20 25 30

Ser Phe Ser Ile Thr Gln Leu Thr Gln Lys Ser Ser Val Asn Asn Ser
 35 40 45

Asn Asn Asn Ser Thr Ile Thr Gln Thr Ala Tyr Lys Asn Glu Asn Ser
 50 55 60

Thr Thr Gln Ala Val Asn Lys Val Lys Asp Ala Val Val Ser Val Ile
 65 70 75 80

Thr Tyr Ser Ala Asn Arg Gln Asn Ser Val Phe Gly Asn Asp Asp Thr
 85 90 95

Asp Thr Asp Ser Gln Arg Ile Ser Ser Glu Gly Ser Gly Val Ile Tyr
 100 105 110

Lys Lys Asn Asp Lys Glu Ala Tyr Ile Val Thr Asn Asn His Val Ile
 115 120 125

Asn Gly Ala Ser Lys Val Asp Ile Arg Leu Ser Asp Gly Thr Lys Val
 130 135 140

Pro Gly Glu Ile Val Gly Ala Asp Thr Phe Ser Asp Ile Ala Val Val
 145 150 155 160

Lys Ile Ser Ser Glu Lys Val Thr Thr Val Ala Glu Phe Gly Asp Ser
 165 170 175

Ser Lys Leu Thr Val Gly Glu Thr Ala Ile Ala Ile Gly Ser Pro Leu
 180 185 190

Gly Ser Glu Tyr Ala Asn Thr Val Thr Gln Gly Ile Val Ser Ser Leu
 195 200 205

Asn Arg Asn Val Ser Leu Lys Ser Glu Asp Gly Gln Ala Ile Ser Thr
 210 215 220

207

Lys Ala Ile Gln Thr Asp Thr Ala Ile Asn Pro Gly Asn Ser Gly Gly
225 230 235 240

Pro Leu Ile Asn Ile Gln Gly Gln Val Ile Gly Ile Thr Ser Ser Lys
245 250 255

Ile Ala Thr Asn Gly Gly Thr Ser Val Glu Gly Leu Gly Phe Ala Ile
260 265 270

Pro Ala Asn Asp Ala Ile Asn Ile Ile Glu Gln Leu Glu Lys Asn Gly
275 280 285

Lys Val Thr Arg Pro Ala Leu Gly Ile Gln Met Val Asn Leu Ser Asn
290 295 300

Val Ser Thr Ser Asp Ile Arg Arg Leu Asn Ile Pro Ser Asn Val Thr
305 310 315 320

Ser Gly Val Ile Val Arg Ser Val Gln Ser Asn Met Pro Ala Asn Gly
325 330 335

His Leu Glu Lys Tyr Asp Val Ile Thr Lys Val Asp Asp Lys Glu Ile
340 345 350

Ala Ser Ser Thr Asp Leu Gln Ser Ala Leu Tyr Asn His Ser Ile Gly
355 360 365

Asp Thr Ile Lys Ile Thr Tyr Tyr Arg Asn Gly Lys Glu Glu Thr Thr
370 375 380

Ser Ile Lys Leu Asn Lys Ser Ser Gly Asp Leu Glu Ser
385 390 395

<210> 153

<211> 939

<212> DNA

<213> Streptococcus pneumoniae

<400> 153

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taccagttgc tcaaggaaac agaccatgca gaaacgggcc aagtgattta cgatgagaag 180
gaagtgtcac tcagagagat tttactttat tatttccgag ttatcgatcc tctatctatc 240
aatcaacaag ggaatgaccg tggtcgcca tatcgaactg ggatttatta tcaggatgaa 300
gcagatttgc cagctatcta cacagtgggtg caggagcagg aacgcatgct gggtcgaaaag 360
attgcagtag aagtggagca attacgccac tacattctgg ctgaagacta ccaccaagac 420
tatctcagga agaatccttc aggttactgt catatcgatg tgaccgatgc tgataagcca 480
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gaccaaacct ttgaagaggg gatttatgta gatattacga caggtgagcc actctttttt 660
gccaaaggata agtttgcttc aggttgttgt tggccaagtt ttagccgtcc gatttcctaa 720
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cgttcaggca gtgctcactt gggtcatgtt ttcacagatg gaccgcggga gttaggcggc 840
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<210> 154

<211> 312

<212> PRT

<213> Streptococcus pneumoniae

<400> 154

```

Met Ala Glu Ile Tyr Leu Ala Gly Gly Cys Phe Trp Gly Leu Glu Glu
  1             5             10             15

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```

Tyr Phe Ser Arg Ile Ser Gly Val Leu Glu Thr Ser Val Gly Tyr Ala
      20             25             30

```

```

Asn Gly Gln Val Glu Thr Thr Asn Tyr Gln Leu Leu Lys Glu Thr Asp
      35             40             45

```


His Ala Glu Thr Val Gln Val Ile Tyr Asp Glu Lys Glu Val Ser Leu
 50 55 60

Arg Glu Ile Leu Leu Tyr Tyr Phe Arg Val Ile Asp Pro Leu Ser Ile
 65 70 75 80

Asn Gln Gln Gly Asn Asp Arg Gly Arg Gln Tyr Arg Thr Gly Ile Tyr
 85 90 95

Tyr Gln Asp Glu Ala Asp Leu Pro Ala Ile Tyr Thr Val Val Gln Glu
 100 105 110

Gln Glu Arg Met Leu Gly Arg Lys Ile Ala Val Glu Val Glu Gln Leu
 115 120 125

Arg His Tyr Ile Leu Ala Glu Asp Tyr His Gln Asp Tyr Leu Arg Lys
 130 135 140

Asn Pro Ser Gly Tyr Cys His Ile Asp Val Thr Asp Ala Asp Lys Pro
 145 150 155 160

Leu Ile Asp Ala Ala Asn Tyr Glu Lys Pro Ser Gln Glu Val Leu Lys
 165 170 175

Ala Ser Leu Ser Glu Glu Ser Tyr Arg Val Thr Gln Glu Ala Ala Thr
 180 185 190

Glu Ala Pro Phe Thr Asn Ala Tyr Asp Gln Thr Phe Glu Glu Gly Ile
 195 200 205

Tyr Val Asp Ile Thr Thr Gly Glu Pro Leu Phe Phe Ala Lys Asp Lys
 210 215 220

Phe Ala Ser Gly Cys Gly Trp Pro Ser Phe Ser Arg Pro Ile Ser Lys
 225 230 235 240

Glu Leu Ile His Tyr Tyr Lys Asp Leu Ser His Gly Met Glu Arg Ile
 245 250 255

Glu Val Arg Ser Arg Ser Gly Ser Ala His Leu Gly His Val Phe Thr
 260 265 270

Asp Gly Pro Arg Glu Leu Gly Gly Leu Arg Tyr Cys Ile Asn Ser Ala
 275 280 285

Ser Leu Arg Phe Val Ala Lys Asp Glu Met Glu Lys Ala Gly Tyr Gly
 290 295 300

Tyr Leu Leu Pro Tyr Leu Asn Lys
 305 310

<210> 155

<211> 870

<212> DNA

<213> Streptococcus pneumoniae

<400> 155

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 catcctgaca atgtggctcc agccatttat ggtaatctcg ttattgcaag ttctgttgaa 420
 gggcaagtct ctgctatcgt agcagacttt ccagagtgtg attttctagc ttacattcca 480
 aactatgaat tacgtactcg cgacagccgt agtgtcttgc ctaaaaaatt gtcttataag 540
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 acccaaggtg tccgtgtaga agcaaaataa 870

<210> 156

<211> 289

<212> PRT

<213> Streptococcus pneumoniae

<400> 156

Met Lys Ile Ile Val Pro Ala Thr Ser Ala Asn Ile Gly Pro Gly Phe

1 5 10 15

Asp Ser Val Gly Val Ala Val Thr Lys Tyr Leu Gln Ile Glu Val Cys

20 25 30

Glu Glu Arg Asp Glu Trp Leu Ile Glu His Gln Ile Gly Lys Trp Ile

35 40 45

Pro His Asp Glu Arg Asn Leu Leu Lys Ile Ala Leu Gln Ile Val

50 55 60

Pro Asp Leu Gln Pro Arg Arg Leu Lys Met Thr Ser Asp Val Pro Leu

65 70 75 80

Ala Arg Gly Leu Gly Ser Ser Ser Ser Val Ile Val Ala Gly Ile Glu

85 90 95

Leu Ala Asn Gln Leu Gly Gln Leu Asn Leu Ser Asp His Glu Lys Leu

100 105 110

Gln Leu Ala Thr Lys Ile Glu Gly His Pro Asp Asn Val Ala Pro Ala

115 120 125

Ile Tyr Gly Asn Leu Val Ile Ala Ser Ser Val Glu Gly Gln Val Ser

130 135 140

Ala Ile Val Ala Asp Phe Pro Glu Cys Asp Phe Leu Ala Tyr Ile Pro

145 150 155 160

Asn Tyr Glu Leu Arg Thr Arg Asp Ser Arg Ser Val Leu Pro Lys Lys

165 170 175

212

Leu Ser Tyr Lys Glu Ala Val Ala Ala Ser Ser Ile Ala Asn Val Ala
180 185 190

Val Ala Ala Leu Leu Ala Gly Asp Met Val Thr Ala Gly Gln Ala Ile
195 200 205

Glu Gly Asp Leu Phe His Glu Arg Tyr Arg Gln Asp Leu Val Arg Glu
210 215 220

Phe Ala Met Ile Lys Gln Val Thr Lys Glu Asn Gly Ala Tyr Ala Thr
225 230 235 240

Tyr Leu Ser Gly Ala Gly Pro Thr Val Met Val Leu Ala Ser His Asp
245 250 255

Lys Met Pro Thr Ile Lys Ala Glu Leu Glu Lys Gln Pro Phe Lys Gly
260 265 270

Lys Leu His Asp Leu Arg Val Asp Thr Gln Gly Val Arg Val Glu Ala
275 280 285

Lys

<210> 157

<211> 564

<212> DNA

<213> Streptococcus pneumoniae

<400> 157

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gtctatcaag ctttaaaggt ttctactcct tttgcgattg agacattcgc tcccaattta 180
gagaattttt tagaaaagta caaggaaaat gaagccagag agcttgaaca cccgatttta 240
tttgaaggag tttctgacct attggaagac atttcaaate aaggtggccg tcattttttg 300
gtctctcatc gaaatgatca ggttttgga attttagaaa aaacctctat agcagcttat 360

tttacagaag tgggtgacttc tagctcaggc ttttaagagaa agccaaatcc cgaatccatg 420
 ctttatttaa gagaaaagta tcagattagc tctgggtcttg tcattgggtga tcggccgatt 480
 gatatcgaag caggtcaagc tgcaggactt gataccact tgtttaccag tatcgtgaat 540
 ttaagacaag tattagacat ataa 564

<210> 158

<211> 187

<212> PRT

<213> Streptococcus pneumoniae

<400> 158

Met Lys Tyr His Asp Tyr Ile Trp Asp Leu Gly Gly Thr Leu Leu Asp

1

5

10

15

Asn Tyr Glu Thr Ser Thr Ala Ala Phe Val Glu Thr Leu Ala Leu Tyr

20

25

30

Gly Ile Thr Gln Asp His Asp Ser Val Tyr Gln Ala Leu Lys Val Ser

35

40

45

Thr Pro Phe Ala Ile Glu Thr Phe Ala Pro Asn Leu Glu Asn Phe Leu

50

55

60

Glu Lys Tyr Lys Glu Asn Glu Ala Arg Glu Leu Glu His Pro Ile Leu

65

70

75

80

Phe Glu Gly Val Ser Asp Leu Leu Glu Asp Ile Ser Asn Gln Gly Gly

85

90

95

Arg His Phe Leu Val Ser His Arg Asn Asp Gln Val Leu Glu Ile Leu

100

105

110

Glu Lys Thr Ser Ile Ala Ala Tyr Phe Thr Glu Val Val Thr Ser Ser

115

120

125

Ser Gly Phe Lys Arg Lys Pro Asn Pro Glu Ser Met Leu Tyr Leu Arg

130

135

140

Glu Lys Tyr Gln Ile Ser Ser Gly Leu Val Ile Gly Asp Arg Pro Ile
 145 150 155 160

Asp Ile Glu Ala Gly Gln Ala Ala Gly Leu Asp Thr His Leu Phe Thr
 165 170 175

Ser Ile Val Asn Leu Arg Gln Val Leu Asp Ile
 180 185

<210> 159

<211> 1875

<212> DNA

<213> Streptococcus pneumoniae

<400> 159

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 ggatttgcca gccatattca agtttttatt gagccagatg attcgattac tgttgtggat 240
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 gtcttttacag tccttcacgc tggaggaaaag ttcggcgggtg gtggatacaa ggtttcaggt 360
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 aaaatcttca ctgaaacaac aatctttgat tttgataaat taaataaacg gattcaagag 600
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 aacaaggatg taatctttga tacaccaatc tatacagacg gtgagatgga tgatatcaca 780
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 aatattcata cccatgaagg tggaacacat gaacaagggt tccgtacagc cttgacacgt 900
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<210> 160

<211> 624

<212> PRT

<213> Streptococcus pneumoniae

<400> 160

Met	Thr	Glu	Glu	Ile	Lys	Asn	Leu	Gln	Ala	Gln	Asp	Tyr	Asp	Ala	Ser
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Gln	Ile	Gln	Val	Leu	Glu	Gly	Leu	Glu	Ala	Val	Arg	Met	Arg	Pro	Gly
			20					25						30	

Met	Tyr	Ile	Gly	Ser	Thr	Ser	Lys	Glu	Gly	Leu	His	His	Leu	Val	Trp
			35				40						45		

Glu	Ile	Val	Asp	Asn	Ser	Ile	Asp	Glu	Ala	Leu	Ala	Gly	Phe	Ala	Ser
			50				55					60			

His	Ile	Gln	Val	Phe	Ile	Glu	Pro	Asp	Asp	Ser	Ile	Thr	Val	Val	Asp
			65				70				75				80

Asp	Gly	Arg	Gly	Ile	Pro	Val	Asp	Ile	Gln	Glu	Lys	Thr	Gly	Arg	Pro
							85					90			95

216

Ala Val Glu Thr Val Phe Thr Val Leu His Ala Gly Gly Lys Phe Gly
100 105 110

Gly Gly Gly Tyr Lys Val Ser Gly Gly Leu His Gly Val Gly Ser Ser
115 120 125

Val Val Asn Ala Leu Ser Thr Gln Leu Asp Val His Val His Lys Asn
130 135 140

Gly Lys Ile His Tyr Gln Glu Tyr Arg Arg Gly His Val Val Ala Asp
145 150 155 160

Leu Glu Ile Val Gly Asp Thr Asp Lys Thr Gly Thr Thr Val His Phe
165 170 175

Thr Pro Asp Pro Lys Ile Phe Thr Glu Thr Thr Ile Phe Asp Phe Asp
180 185 190

Lys Leu Asn Lys Arg Ile Gln Glu Leu Ala Phe Leu Asn Arg Gly Leu
195 200 205

Gln Ile Ser Ile Thr Asp Lys Arg Gln Gly Leu Glu Gln Thr Lys His
210 215 220

Tyr His Tyr Glu Gly Gly Ile Ala Ser Tyr Val Glu Tyr Ile Asn Glu
225 230 235 240

Asn Lys Asp Val Ile Phe Asp Thr Pro Ile Tyr Thr Asp Gly Glu Met
245 250 255

Asp Asp Ile Thr Val Glu Val Ala Met Gln Tyr Thr Thr Gly Tyr His
260 265 270

Glu Asn Val Met Ser Phe Ala Asn Asn Ile His Thr His Glu Gly Gly
275 280 285

Thr His Glu Gln Gly Phe Arg Thr Ala Leu Thr Arg Val Ile Asn Asp
290 295 300

Arg Tyr Gln Lys Leu Val Leu Met Thr Asp Ala Asp Val Asp Gly Ala
500 505 510

His Ile Arg Thr Leu Leu Leu Thr Leu Ile Tyr Arg Tyr Met Lys Pro
 515 520 525

Ile Leu Glu Ala Gly Tyr Val Tyr Ile Ala Gln Pro Pro Ile Tyr Gly
 530 535 540

Val Lys Val Gly Ser Glu Ile Lys Glu Tyr Ile Gln Pro Gly Ala Asp
 545 550 555 560

Gln Glu Ile Lys Leu Gln Glu Ala Leu Ala Arg Tyr Ser Glu Gly Arg
 565 570 575

Thr Lys Pro Thr Ile Gln Arg Tyr Lys Gly Leu Gly Glu Met Asp Asp
 580 585 590

His Gln Leu Trp Glu Thr Thr Met Asp Pro Glu His Arg Leu Met Ala
 595 600 605

Arg Val Ser Val Asp Asp Val Gln Lys Gln Ile Lys Ser Leu Ile Cys
 610 615 620

<210> 161

<211> 1446

<212> DNA

<213> Streptococcus pneumoniae

<400> 161

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 aatcgtttaa atgcgacttc taattactca gaatattcaa tcagtgtcgc tgttttagca 360

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aatgaaaata ttcagaaatt actagctgat atcaagtcaa gtcagaatac cgatttgacg 480
gtcaaccaga gttcgtctta cttggcagct tacaagagtt tgattgcagg ggagactaag 540
gccattgtcc taaatagtgt ctttgaaaac atcatcgagt cagagtatcc agactacgca 600
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tctaagagtc agtctttcaa tatctatggt agtggaattg acacctatgg tcttattagt 720
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gggacaggtc ggatggatct tcttcttat gcaatgccag acagtaacct ctatgtgatg 1380
gaaatagatg atagtagttt agctgtagtt aaagcagcta tacaggatgt gatggagggt 1440
agatga 1446

<210> 162

<211> 481

<212> PRT

<213> *Streptococcus pneumoniae*

<400> 162

Met Ser Arg Arg Phe Lys Lys Ser Arg Ser Gln Lys Val Lys Arg Ser
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Val Asn Ile Val Leu Leu Thr Ile Tyr Leu Leu Leu Val Cys Phe Leu
20 25 30

Leu Phe Leu Ile Phe Lys Tyr Asn Ile Leu Ala Phe Arg Tyr Leu Asn
35 40 45

Leu Val Val Thr Ala Leu Val Leu Leu Val Ala Leu Val Gly Leu Leu
50 55 60

[illegible]

Thr Lys Lys Ile Leu Leu Thr Thr Thr Pro Arg Asp Ala Tyr Val Pro
260 265 270

Ile Ala Asp Gly Gly Asn Asn Gln Lys Asp Lys Leu Thr His Ala Gly
 275 280 285

Ile Tyr Gly Val Asp Ser Ser Ile His Thr Leu Glu Asn Leu Tyr Gly
 290 295 300

Val Asp Ile Asn Tyr Tyr Val Arg Leu Asn Phe Thr Ser Phe Leu Lys
 305 310 315 320

Leu Ile Asp Leu Leu Gly Gly Ile Asp Val Tyr Asn Asp Gln Glu Phe
 325 330 335

Thr Ala His Thr Asn Gly Lys Tyr Tyr Pro Ala Gly Asn Val His Leu
 340 345 350

Asp Ser Glu Gln Ala Leu Gly Phe Val Arg Glu Arg Tyr Ser Leu Ala
 355 360 365

Asp Gly Asp Arg Asp Arg Gly Arg His Gln Gln Lys Val Ile Val Ala
 370 375 380

Ile Leu Gln Lys Leu Thr Ser Thr Glu Val Leu Lys Asn Tyr Ser Thr
 385 390 395 400

Ile Ile Asn Ser Leu Gln Asp Ser Ile Gln Thr Asn Met Pro Leu Glu
 405 410 415

Thr Met Ile Asn Leu Val Asn Ala Gln Leu Glu Ser Gly Gly Asn Tyr
 420 425 430

Lys Val Asn Ser Gln Asp Leu Lys Gly Thr Gly Arg Met Asp Leu Pro
 435 440 445

Ser Tyr Ala Met Pro Asp Ser Asn Leu Tyr Val Met Glu Ile Asp Asp
 450 455 460

Ser Ser Leu Ala Val Val Lys Ala Ala Ile Gln Asp Val Met Glu Gly
 465 470 475 480

Arg

<210> 163

<211> 732

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 163

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cagggttcggg aaatagctaa ggaagtggcg agtgacttgg tcattgotta cggggctgaa 240
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caagtaaata gtacacatgt cctcaaacc aaactttttg gcgaacgtta taaattcatg 540
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cacaatctag acggtagacc tcctcatatg gcagaagcat atgacctgt tacccaaaaa 660
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caactaattt ag 732

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<210> 164

<211> 243

<212> PRT

<213> *Streptococcus pneumoniae*

<400> 164

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Met Ile Asp Ile His Ser His Ile Val Phe Asp Val Asp Asp Gly Pro
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Lys Ser Arg Glu Glu Ser Lys Ala Leu Leu Ala Glu Ser Tyr Arg Gln
 20             25             30

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Lys Ala Gln Glu Leu Phe Ile Asp Asn Pro Arg Lys Ile Val Met Asp
225 230 235 240

Gln Leu Ile

<210> 165

<211> 3990

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 165

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tcaactccta gtgataaagc agaagtggta actccaactt ctgctgaaaa agaaactgct 420
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cgttattcac catcacgcct cttcaaactc atgcgctcatt ttgcaaatgc caacgctgaa 1680
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<210> 166

<211> 1329

<212> PRT

<213> Streptococcus pneumoniae

<400> 166

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Val Gly Ala Ala Ser Val Leu Ile Gly Phe Ala Phe Gln Ala Gln Thr
 35 40 45

Val Ala Ala Asp Gly Val Thr Pro Thr Thr Thr Glu Asn Gln Pro Thr
 50 55 60

Ile His Thr Val Ser Asp Ser Pro Gln Ser Ser Glu Asn Arg Thr Glu
 65 70 75 80

Glu Thr Pro Lys Ala Val Leu Gln Pro Glu Ala Pro Lys Thr Val Glu
 85 90 95

Thr Glu Thr Pro Ala Thr Asp Lys Val Ala Ser Leu Pro Lys Thr Glu
 100 105 110

Glu Lys Pro Gln Glu Glu Val Ser Ser Thr Pro Ser Asp Lys Ala Glu
 115 120 125

Val Val Thr Pro Thr Ser Ala Glu Lys Glu Thr Ala Asn Lys Lys Ala
 130 135 140

227

Glu Glu Ala Ser Pro Lys Lys Glu Glu Ala Lys Glu Val Asp Ser Lys
145 150 155 160

Glu Ser Asn Thr Asp Lys Thr Asp Lys Asp Lys Pro Ala Lys Lys Asp
165 170 175

Glu Ala Lys Ala Glu Ala Asp Lys Pro Ala Thr Glu Ala Gly Lys Glu
180 185 190

Arg Ala Ala Thr Val Asn Glu Lys Leu Ala Lys Lys Lys Lys Ile Val Ser
195 200 205

Ile Asp Ala Gly Arg Lys Tyr Phe Ser Pro Glu Gln Leu Lys Glu Ile
210 215 220

Ile Asp Lys Ala Lys His Tyr Gly Tyr Thr Asp Leu His Leu Leu Val
225 230 235 240

Gly Asn Asp Gly Leu Arg Phe Met Leu Asp Asp Met Ser Ile Thr Ala
245 250 255

Asn Gly Lys Thr Tyr Ala Ser Asp Asp Val Lys Arg Ala Ile Glu Lys
260 265 270

Gly Thr Asn Asp Tyr Tyr Asn Asp Pro Asn Gly Asn His Leu Thr Glu
275 280 285

Ser Gln Met Thr Asp Leu Ile Asn Tyr Ala Lys Asp Lys Gly Ile Gly
290 295 300

Leu Ile Pro Thr Val Asn Ser Pro Gly His Met Asp Ala Ile Leu Asn
305 310 315 320

Ala Met Lys Glu Leu Gly Ile Gln Asn Pro Asn Phe Ser Tyr Phe Gly
325 330 335

Lys Lys Ser Ala Arg Thr Val Asp Leu Asp Asn Glu Gln Ala Val Ala
340 345 350

Phe Thr Lys Ala Leu Ile Asp Lys Tyr Ala Ala Tyr Phe Ala Lys Lys
 355 360 365

Thr Glu Ile Phe Asn Ile Gly Leu Asp Glu Tyr Ala Asn Asp Ala Thr
 370 375 380

Asp Ala Lys Gly Trp Ser Val Leu Gln Ala Asp Lys Tyr Tyr Pro Asn
 385 390 395 400

Glu Gly Tyr Pro Val Lys Gly Tyr Glu Lys Phe Ile Ala Tyr Ala Asn
 405 410 415

Asp Leu Ala Arg Ile Val Lys Ser His Gly Leu Lys Pro Met Ala Phe
 420 425 430

Asn Asp Gly Ile Tyr Tyr Asn Ser Asp Thr Ser Phe Gly Ser Phe Asp
 435 440 445

Lys Asp Ile Ile Val Ser Met Trp Thr Gly Gly Trp Gly Gly Tyr Asp
 450 455 460

Val Ala Ser Ser Lys Leu Leu Ala Glu Lys Gly His Gln Ile Leu Asn
 465 470 475 480

Thr Asn Asp Ala Trp Tyr Tyr Val Leu Gly Arg Asn Ala Asp Gly Gln
 485 490 495

Gly Trp Tyr Asn Leu Asp Gln Gly Leu Asn Gly Ile Lys Asn Thr Pro
 500 505 510

Ile Thr Ser Val Pro Lys Thr Glu Gly Ala Asp Ile Pro Ile Ile Gly
 515 520 525

Gly Met Val Ala Ala Trp Ala Asp Thr Pro Ser Ala Arg Tyr Ser Pro
 530 535 540

Ser Arg Leu Phe Lys Leu Met Arg His Phe Ala Asn Ala Asn Ala Glu
 545 550 555 560

Tyr Phe Ala Ala Asp Tyr Glu Ser Ala Glu Gln Ala Leu Asn Glu Val
 565 570 575

Pro Lys Asp Leu Asn Arg Tyr Thr Ala Glu Ser Val Thr Ala Val Lys
 580 585 590

Glu Ala Glu Lys Ala Ile Arg Ser Leu Asp Ser Asn Leu Ser Arg Ala
 595 600 605

Gln Gln Asp Thr Ile Asp Gln Ala Ile Ala Lys Leu Gln Glu Thr Val
 610 615 620

Asn Asn Leu Thr Leu Thr Pro Glu Ala Gln Lys Glu Glu Glu Ala Lys
 625 630 635 640

Arg Glu Val Glu Lys Leu Ala Lys Asn Lys Val Ile Ser Ile Asp Ala
 645 650 655

Gly Arg Lys Tyr Phe Thr Leu Asn Gln Leu Lys Arg Ile Val Asp Lys
 660 665 670

Ala Ser Glu Leu Gly Tyr Ser Asp Val His Leu Leu Leu Gly Asn Asp
 675 680 685

Gly Leu Arg Phe Leu Leu Asp Asp Met Thr Ile Thr Ala Asn Gly Lys
 690 695 700

Thr Tyr Ala Ser Asp Asp Val Lys Lys Ala Ile Ile Glu Gly Thr Lys
 705 710 715 720

Ala Tyr Tyr Asp Asp Pro Asn Gly Thr Ala Leu Thr Gln Ala Glu Val
 725 730 735

Thr Glu Leu Ile Glu Tyr Ala Lys Ser Lys Asp Ile Gly Leu Ile Pro
 740 745 750

Ala Ile Asn Ser Pro Gly His Met Asp Ala Met Leu Val Ala Met Glu
 755 760 765

Lys Leu Gly Ile Lys Asn Pro Gln Ala His Phe Asp Lys Val Ser Lys
 770 775 780

Thr Thr Met Asp Leu Lys Asn Glu Glu Ala Met Asn Phe Val Lys Ala
 785 790 795 800

Leu Ile Gly Lys Tyr Met Asp Phe Phe Ala Gly Lys Thr Lys Ile Phe
 805 810 815

Asn Phe Gly Thr Asp Glu Tyr Ala Asn Asp Ala Thr Ser Ala Gln Gly
 820 825 830

Trp Tyr Tyr Leu Lys Trp Tyr Gln Leu Tyr Gly Lys Phe Ala Glu Tyr
 835 840 845

Ala Asn Thr Leu Ala Ala Met Ala Lys Glu Arg Gly Leu Gln Pro Met
 850 855 860

Ala Phe Asn Asp Gly Phe Tyr Tyr Glu Asp Lys Asp Asp Val Gln Phe
 865 870 875 880

Asp Lys Asp Val Leu Ile Ser Tyr Trp Ser Lys Gly Trp Trp Gly Tyr
 885 890 895

Asn Leu Ala Ser Pro Gln Tyr Leu Ala Ser Lys Gly Tyr Lys Phe Leu
 900 905 910

Asn Thr Asn Gly Asp Trp Tyr Tyr Ile Leu Gly Gln Lys Pro Glu Asp
 915 920 925

Gly Gly Gly Phe Leu Lys Lys Ala Ile Glu Asn Thr Gly Lys Thr Pro
 930 935 940

Phe Asn Gln Leu Ala Ser Thr Lys Tyr Pro Glu Val Asp Leu Pro Thr
 945 950 955 960

Val Gly Ser Met Leu Ser Ile Trp Ala Asp Arg Pro Ser Ala Glu Tyr
 965 970 975

Lys Glu Glu Glu Ile Phe Glu Leu Met Thr Ala Phe Ala Asp His Asn
 980 985 990

Lys Asp Tyr Phe Arg Ala Asn Tyr Asn Ala Leu Arg Glu Glu Leu Ala
 995 1000 1005

Lys Ile Pro Thr Asn Leu Glu Gly Tyr Ser Lys Glu Ser Leu Glu Ala
 1010 1015 1020

Leu Asp Ala Ala Lys Thr Ala Leu Asn Tyr Asn Leu Asn Arg Asn Lys
 1025 1030 1035 1040

Gln Ala Glu Leu Asp Thr Leu Val Ala Asn Leu Lys Ala Ala Leu Gln
 1045 1050 1055

Gly Leu Lys Pro Ala Val Thr His Ser Gly Ser Leu Asp Glu Asn Glu
 1060 1065 1070

Val Ala Ala Asn Val Glu Thr Arg Pro Glu Leu Ile Thr Arg Thr Glu
 1075 1080 1085

Glu Ile Pro Phe Glu Val Ile Lys Lys Glu Asn Pro Asn Leu Pro Ala
 1090 1095 1100

Gly Gln Glu Asn Ile Ile Thr Ala Gly Val Lys Gly Glu Arg Thr His
 1105 1110 1115 1120

Tyr Ile Ser Val Leu Thr Glu Asn Gly Lys Thr Thr Glu Thr Val Leu
 1125 1130 1135

Asp Ser Gln Val Thr Lys Glu Val Ile Asn Gln Val Val Glu Val Gly
 1140 1145 1150

Ala Pro Val Thr His Lys Gly Asp Glu Ser Gly Leu Ala Pro Thr Thr
 1155 1160 1165

Glu Val Lys Pro Arg Leu Asp Ile Gln Glu Glu Glu Ile Pro Phe Thr
 1170 1175 1180

1180-1190

232

Thr Val Thr Cys Glu Asn Pro Leu Leu Lys Gly Lys Thr Gln Val
1185 1190 1195 1200

Ile Thr Lys Gly Val Asn Gly His Arg Ser Asn Phe Tyr Ser Val Ser
1205 1210 1215

Thr Ser Ala Asp Gly Lys Glu Val Lys Thr Leu Val Asn Ser Val Val
1220 1225 1230

Ala Gln Glu Ala Val Thr Gln Ile Val Glu Val Gly Thr Met Val Thr
1235 1240 1245

His Val Gly Asp Glu Asn Gly Gln Ala Ala Ile Ala Glu Glu Lys Pro
1250 1255 1260

Lys Leu Glu Ile Pro Ser Gln Pro Ala Pro Ser Thr Ala Pro Ala Glu
1265 1270 1275 1280

Glu Ser Lys Val Leu Pro Gln Asp Pro Ala Pro Val Val Thr Glu Lys
1285 1290 1295

Lys Leu Pro Glu Thr Gly Thr His Asp Ser Ala Gly Leu Val Val Ala
1300 1305 1310

Gly Leu Met Ser Thr Leu Ala Ala Tyr Gly Leu Thr Lys Arg Lys Glu
1315 1320 1325

Asp

<210> 167

<211> 825

<212> DNA

<213> Streptococcus pneumoniae

<400> 167

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cagaaaaaac aagcgtctga agctcctagt caagcattgg cagagagtgt cttaacagac 180

gcagtcaaga gtcaaataaa ggggagtctg gaggtggaatg gctcaggtgc ttttatcgtc 240
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actcgtcagt acaagaatcg taaagaaact gggaatgggt caacttcttg gactcctcca 420
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gccaaagtctt cggatggaga attggaattc aatgttctag ttcccaatgt tcaaaaggga 780
cttcaactgg attaccgaac tggagaagta actgtaactc agtaa 825

<210> 168

<211> 274

<212> PRT

<213> Streptococcus pneumoniae

<400> 168

Met Asn Lys Lys Thr Arg Gln Thr Leu Ile Gly Leu Leu Val Leu Leu
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Leu Leu Ser Thr Gly Ser Tyr Tyr Ile Lys Gln Met Pro Ser Ala Pro
20 25 30

Asn Ser Pro Lys Thr Asn Leu Ser Gln Lys Lys Gln Ala Ser Glu Ala
35 40 45

Pro Ser Gln Ala Leu Ala Glu Ser Val Leu Thr Asp Ala Val Lys Ser
50 55 60

Gln Ile Lys Gly Ser Leu Glu Trp Asn Gly Ser Gly Ala Phe Ile Val
65 70 75 80

Asn Gly Asn Lys Thr Asn Leu Asp Ala Lys Val Ser Ser Lys Pro Tyr
85 90 95

[illegible]

Thr Gln

<210> 169

<211> 225

<212> DNA

<213> Streptococcus pneumoniae

<400> 169

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 ggtttaatgg taggttatgg aatcttgggc aaggggtcaag atccatgggc tatcctgtct 180
 ccagcaaaat ggcaggaatt gattcataaa tttacaggaa attag 225

<210> 170

<211> 74

<212> PRT

<213> Streptococcus pneumoniae

<400> 170

Val Leu Arg Phe Ser Gly Leu Arg Gln Val Met Lys Met Asn Lys Lys
 1 5 10 15

Ser Ser Tyr Val Val Lys Arg Leu Leu Leu Val Ile Ile Val Leu Ile
 20 25 30

Leu Gly Thr Leu Ala Leu Gly Ile Gly Leu Met Val Gly Tyr Gly Ile
 35 40 45

Leu Gly Lys Gly Gln Asp Pro Trp Ala Ile Leu Ser Pro Ala Lys Trp
 50 55 60

Gln Glu Leu Ile His Lys Phe Thr Gly Asn
 65 70

<210> 171

<211> 40

<212> DNA

<213> Artificial Sequence

<223> Description of Artificial Sequence: Primer

cgagatctga tatctcacia acagataacg gcgtaaatag

40

<211> 43

<212> DNA

<213> Artificial Sequence

<223> Description of Artificial Sequence: Primer

gaagatcttc cccgggatca caaacagata acggcgtaaa tag

43

<211> 42

<212> DNA

<213> Artificial Sequence

<223> Description of Artificial Sequence: Primer

cgagatctga tatccatcac aaacagataa cggcgtaa at ag

42

<211> 32

<212> DNA

<213> Artificial Sequence

<223> Description of Artificial Sequence: Primer

<400> 177

gcggatcccc cgggcttaat taatgtttaa acactagtcg aagatctcgc gaattctcct 60
gtgtgaaatt gttatccgct a 81

<210> 178

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 178

cgccagggtt ttcccagtcg cgac 24

<210> 179

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 179

tcaggggggc ggagcctatg 20

<210> 180

<211> 22

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 180

tcgtatgttg tgtggaattg tg 22

<210> 181

<211> 26

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 181

tccggctcgt atgttgtgtg gaattg

26

<210> 182

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<221> SITE

<222> (3)

<223> Xaa=Any amino acid

<220>

<223> Description of Artificial Sequence: Cell wall
anchoring motif

<400> 182

Leu Pro Xaa Thr Gly

1

5

<210> 183

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 183

gcgggatccg ccaccatg

18

<210> 184

<211> 10

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 184

ttgcgggccgc

10

<210> 185

<211> 43

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 185

cggatccgcc accatgggtc taattgaaga cttaaaaaat caa

43

<210> 186

<211> 36

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 186

ttgcggccgc caatgctaga ctaaacacaa gactca

36

<210> 187

<211> 36

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 187

cgcggatcca tgaaaaaaat ctattcattt ttagca

36

<210> 188

<211> 38

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 188

ccctcgaggg ctacttccga tacattttta actgtagg

38

<210> 189

<211> 35

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 189

cggatccgcc accatgagtc atgtcgctgc aaatg

35

<213> Artificial Sequence

<223> Description of Artificial Sequence: Primer

32

<213> Artificial Sequence

<223> Description of Artificial Sequence: Primer

38

<213> Artificial Sequence

<223> Description of Artificial Sequence: Primer

30

<210> 193

<211> 40

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 193

cggatccgcc accatggagg tatgtgaaat gtcacgtaaa

40

<210> 194

<211> 32

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

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32

<210> 195

<211> 48

<212> PRT

<213> Streptococcus pneumoniae

<400> 195

Gly Ile Arg Leu Arg Asn Met Leu Phe Lys Ile Trp Pro Ala Val Ala

1

5

10

15

Leu Val Thr Ser Ser Gly Asn Asn Val Ser Met Leu His Ser Ile Ala

20

25

30

Asn Met Gly Gln Leu Thr Leu Gly Thr Gln Cys Gln Thr Val Val Val

35

40

45

<211> 11

<212> PRT

<213> Streptococcus pneumoniae

<400> 196

Gln Lys Ile Thr Met Ile Thr Phe Thr Phe Gln

1

5

10